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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 10, NUMBER 10
MAY 15, 1977

W77-04601 -- W77-05100
CODEN: SWRABW

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 10
MAY 15, 1977

W77-04601 -- W77-05100

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

EQUILIBRIUM STATISTICAL MECHANICAL CALCULATION OF THE MOLECULAR DIFFUSION COEFFICIENT FOR ISOTOPIC IMPURITIES IN LIQUID WATER,
Nevada Univ., Reno. Desert Research Inst.
C. M. Case.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 050, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, Technical Report Series H-W, Publication No. 29, December 1976. 24 p, 6 fig, 33 ref. OWRT A-052-NEV(1). 14-31-0001-4028.

Descriptors: *Hydrogen bonding, Mathematical models, *Dispersion, Mass transfer, Thermodynamic behavior, Diffusion, *Isotope studies, Equilibrium, Equations, *Molecular structure, Statistical methods, Water properties, Denterium.
Identifiers: *Molecular diffusion coefficient, *Diffusion coefficients, Isotoptic impurities(Water), Liquid water.

Equilibrium statistical - mechanical calculations of the molecular diffusion coefficient for HDO, HTO, and H2180 have been carried out. The assumption of pair-wise additive potentials for the interactions of the water molecules has been made and a boundary condition for the molecules on the edge of the cluster (system) considered was imposed. Because of this and the essentially configurational nature of the partition functions that were used, relative values of the diffusion coefficients are of the most interest. In general it was found that the diffusion coefficients were smaller for more massive clusters and that the strong temperature dependence of the basic equation for the diffusion coefficients (higher temperature for larger diffusion coefficients) used persisted through the calculation. It was possible to examine the dependence of the calculated diffusion coefficients on impurity concentration and in general it was found that a higher concentration of impurities means a more massive cluster and hence a smaller diffusion coefficient, i.e., less of a tendency for diffusion than what a boundary-value solution of the heat diffusion equation using a constant diffusion coefficient for all values of concentration would predict.
W77-04999

2. WATER CYCLE

2A. General

WHY SIMULATION,
For primary bibliographic entry see Field 2E.
W77-04725

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS.
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04730

ENVIRONMENTAL IMPACT OF URBAN STORMWATER RUNOFF,
American Society of Civil Engineers, New York. Urban Water Resources Research Program.
For primary bibliographic entry see Field 5B.
W77-04731

IMPACT OF STORMWATER RUNOFF ON RECEIVING WATER QUALITY,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-04734

INTRODUCTION TO URBAN STORMWATER RUNOFF MODELS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-04735

THE WRE STORM MODEL,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-04737

THE EPA STORMWATER MANAGEMENT MODEL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W77-04738

DECISION-MAKING FOR WATER QUANTITY AND QUALITY CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W77-04739

SELECTED CASE STUDIES USING STORMWATER MANAGEMENT MODELS -- QUANITITY ASPECTS,
Orlob (G. T.), and Associates, Orinda, Calif.
For primary bibliographic entry see Field 2E.
W77-04740

PLANNING A STUDY USING STORMWATER MANAGEMENT MODELS,
Orlob (G. T.), and Associates, Orinda, Calif.
For primary bibliographic entry see Field 5B.
W77-04741

THREE CASE STUDIES ON THE APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5B.
W77-04742

COMPARATIVE ANALYSIS OF URBAN STORMWATER MODELS,
Battelle Pacific Northwest Lab., Richland, Wash.
For primary bibliographic entry see Field 5B.
W77-04743

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 1. MATHEMATICAL SOLUTIONS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-04744

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 2. EFFECT OF INFILTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
B. Sherman, and V. P. Singh.
Water Resources Research, Vol. 12, No. 5, p 897-901, October 1976. 4 fig, 15 ref, 1 append.

Descriptors: *Model studies, *Infiltration, *Overland flow, Distribution systems, Hydrologic systems, Mathematical models, Agricultural watersheds, Runoff, Rainfall, Rainfall-runoff relationships, Hydrology, Equations.
Identifiers: Kinematic wave theory, Watershed dynamics, Watershed response.

The overland flow on an infiltrating converging surface was studied. Mathematical solutions were developed to study the effect of infiltration on nonlinear overland flow dynamics. To develop mathematical solutions, infiltration and rainfall were represented by simple time and space invariant functions. For complex rainfall and infiltration functions, explicit solutions were not feasible. (See also W77-04744) (Lee-ISWS)
W77-04745

MICRO-RELIEF SURFACE DEPRESSION STORAGE: ANALYSIS OF MODELS TO DESCRIBE THE DEPTH-STORAGE FUNCTION,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-04895

A SUBALPINE SNOWMELT RUNOFF MODEL,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. E. Allen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 046, Price codes: A08 in paper copy, A01 in microfiche. Wyoming Water Resources Series No. 65, December 1976. 163 p, 25 fig, 7 tab, 54 ref, append. OWRT A-010-WYO(5), 14-31-0001-3551, 3851.

Descriptors: *Computer models, *Snow cover, *Snowmelt, *Runoff, Hydrology, Solar radiation, *Wyoming, Model studies, Simulation analysis, Watersheds(Basins).
Identifiers: *Flow routing, *Subalpine watersheds, Nash Fork basin(Wyo).

A digital computer model for simulating daily watershed runoff from snowmelt under subalpine conditions has been developed in first-gemeration doem. Solar radiation is the primary source for snowmelt. The areal extent of snowcover is calculated with a submodel derived through stepwise multiple regression techniques. Insolation measured in or near the basin is adjusted to the latitude, slope, and aspect of each segment in the basin, then adjusted for albedo and combined with longwave radiation for the net radiation exchange producing potential snowmelts. These snowmelts are adjusted for snowpack conditions and distrbution, and become the runoff from each segment to be routed through flow points as daily discharge. Comparison of simulated flows with observed flows indicated reasonably satisfactory model performance. The model was developed and tested for the Nash Fork basin in southeastern Wyoming, but there are no theoretical reasons to prevent application of the model to other watersheds where snowmelt is the dominant source of streamflow.
W77-05000

RAINFALL-RUNOFF MODELS,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. K. Linsley.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 16-53 (Chapter 2), McGraw-Hill, Inc., New York, N.Y., 1976. 10 fig, 1 tab, 64 ref.

Descriptors: *Rainfall-runoff relationships, *Hydrology, *Mathematical models, *Simulation analysis, Unit hydrographs, Infiltration, Design, Snowmelt, Computers, Water balance, Channel flow, Equations, Hydrologic aspects, Stochastic processes, Systems analysis.
Identifiers: Stanford watershed model, Hydrocomp Simulation Program.

This chapter examines rainfall-runoff models. One of the key hydrological problems has always been to estimate the flow of ungaged streams or to extend the available records of gaged streams. Linsley, who pioneered modeling work in this area with his Stanford Watershed Model, reviews some of the early developments which lead to his work--unit hydrographs, determination of inflitration rates and snowmelt, the coaxial method, and other developments in the 1950's, including the advent of computers. The structure of a water balance model is succinctly described, including the functions of rainfall, evapotranspiration, interception, impervious area runoff, soil moisture storage, infiltration, interflow, upper zone storage, overland flow, interflow discharge, groundwater, and other relevant parameters. These functions are discussed with specific reference to the hydrocomp Simulation Program, which is the latest and most completely tested model deriving from the original Stanford Watershed Model. Finally, Linsley comments on the application as well as the future of simulation. Simulation analysis is in all probability the method of the future in parametric hydrology and it may be useful as a complementary tool in stochastic hydrology. (See also W77-05008) (Bell-Cornell)
W77-05010

2B. Precipitation

COMPUTATION OF SOLAR RADIATION FROM SKY COVER,
National Weather Service, Silver Spring, Md. Office of Hydrology.
E. S. Thompson.
Water Resources Research, Vol. 12, No. 5, p 859-865, October 1976. 5 fig, 2 tab, 6 ref, 1 append.

Descriptors: *Cloud cover, *Solar radiation, *Model studies, *Equations, Mathematical models, Analytical techniques, Data processing, Correlation analysis, Radiation, Energy transfer, Atmosphere, Meteorology.

A procedure for estimating global solar radiation from sky cover was developed from the records of 47 stations in the United States, with long periods of radiation observations during the 10-year period, March 1961 through February 1971. The proceuure fits a general parabolic equation of the form Y = B + (1 - B) (1 - N to the P power) to the observations, where Y is the observed global solar radiation divided by clear sky radiation and N is the sky cover. The variables B (the point at which the parabola crosses the y axis) and P (a variable parameter less than 1.0) were selected to minimize the sum of the errors (Y - Y sub calc squared), where Y sub calc is the calculated value of Y. The equation Y = B + (1 - B) (1 - N to the 0.61 power) was selected as most representative, and the B values in this equation that minimize the sum of the errors squared for the individual stations were shown. The average absolute error of the 5,306 data points is 1.18 MJ/sq m, or 7% of the average observed radiation. Because of the uncertainties of the observed global solar radiation and observed sky cover, the procedure should be used with caution, particularly for periods of less than 1 month. (Sims-ISWS)
W77-04772

RAINFALL IN THE SUDAN SAVANNA REGION OF NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
J. M. Kowal, and A. H. Kassam.
Weather, Vol. 30, No. 1, p 24-28, January, 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Rainfall, *Droughts, *Meteorology, *Climatic zones, *Weather forecasting, *Africa, Precipitation(Atmospheric), Monsoons, Climatic data, Forecasting, Projections, Frequency analysis, Climatology, Probable maximum precipitation, Meteorological data, Arid lands, Arid climates.
Identifiers: *Nigeria(Sudan Savanna region), *Sahel.

World-wide concern is being expressed about the below average monsoon rainfall received during recent years in the Sudano-Sahelian region of West Africa. The rainfall probability at two stations in Nigeria, Kano and Sokoto, for which rainfall records are available for over sixty years, is assessed. The variation with time of the annual rainfall at Kano and other stations in the sudan region of northern Nigeria is also examined. Climatic changes and their effects on rainfall patterns are analyzed. From analyses of the rainfall records at these two stations it appears very likely that the rainfall at Kano and Sokoto during the 1974 season will be higher than rainfall during 1973, and rather less likely that it will be higher than that during 1972. From an examination of the time variation of the annual rainfall at six stations in northern Nigeria it seems very likely that the annual rainfall in the Sudan (and Sahel) region will increase towards 1980. (Jamail-Arizona)
W77-04790

SPACIAL VARIATION OF PRECIPITATION ON THE TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
D. R. Haragan.
Water Resources Bulletin, Vol. 12, No. 6, p 1191-1204, December, 1976. 11 fig, 4 ref.

Descriptors: *Rainfall, *Weather modification, *Cloud seeding, *Artificial precipitation, *Correlation analysis, *Texas, Precipitation(Atmospheric), Water supply, Weather data, Weather forecasting, Agriculture, Distribution, Rainfall disposition, Climatology, Probability, Chemistry of precipitation, Weather, Variability, Semiarid climates.
Identifiers: *Texas High Plains.

In order to evaluate properly attempts at artificial precipitation augmentation, it is necessary first to understand natural precipitation variability in space and time. These variables for the Texas High Plains are presented. This type of information is essential, too, in solving a variety of problems dealing with irrigation, crop yields, drainage, and water supply. Mean annual rainfall for the Texas High Plains over a thirty-year period is presented. Peak rainfall occurs in May; the five-month period November through March is a dry season. The sequence of meteorological events leading to precipitation is discussed. The spacial variation of monthly rainfall totals was investigated further by use of the coefficient of correlation between individual stations. Mean annual precipitation along the Texas-New Mexico border is about 16 inches, along the eastern border 22 to 24 inches. Analyses of space autocorrelation fields indicated that correlation in precipitation amounts varies with both distance and direction. The possibility of using space autocorrelation analysis to evaluate weather modification projects is discussed in detail. (Jamail-Arizona)
W77-04793

BIG THOMPSON CANYON FLASH FLOOD OF JULY 30-AUGUST 1, 1976. A REPORT TO THE ADMINISTRATOR.
National Oceanic and Atmospheric Administration, Rockville, Md.
NOAA Natural Disaster Survey Report 76-1, November 1976. 48 p, 20 fig.

Descriptors: *Flash floods, *Flood data, *Rain, *Runoff, *Flooding, *Warning systems, Flood damage, Meteorological data, Storms, Flood forecasting, *Colorado.
Identifiers: *Big Thompson Canyon(CO).

The Big Thompson flash flood struck on the evening of July 31, 1976. A few short hours separated the onset of heavy rain from the flood crest passing the canyon mouth to quickly subside on the plains below. The heroic efforts of law enforcement officers and rescue workers kept the loss of lives from being higher but at least 135 persons were killed and the search for the missing continues. The Big Thompson River is a tributary of the South Platte River. Its source is in Rocky Mountain National Park in north-central Colorado. On the evening of July 31, 1976, a very heavy rain fell over a 70-square mile area in the central portion of the watershed. The most intense rainfall, more than 12 inches, occurred over the slopes of the western third of the Big Thompson Canyon. More than four inches of rain fell over the entire canyon area. The resulting runoff exceeded the highest previously recorded by almost an order of magnitude, reaching an estimated 31,200 cubic feet per second at the mouth of the canyon. Information is given on methods of data acquisition, the meteorological conditions and forecasts as the river began to rise. Finally, the methods of dissemination of warnings and the public response are detailed. (NOAA)
W77-04833

MODEL OF HURRICANE TIDE IN CAPE FEAR ESTUARY,
National Meteorological Center, Washington, D.C.
For primary bibliographic entry see Field 2L.
W77-04898

2C. Snow, Ice, and Frost

AREAL DIFFERENTIATION OF SNOW COVER IN EAST CENTRAL ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
W. P. Adams.
Water Resources Research, Vol, 12, No 6, p 1226-1234, December 1976. 3 fig, 6 tab, 14 ref.

Descriptors: *Snow cover, *Snow surveys, *Vegetation effects, *Canada, Snow, *Areal, Precipitation(Atmospheric), Surveys, Sampling, Snowpacks, Moisture content, Density, Water resources, Vegetation, On-site investigations.
Identifiers: *Ontario.

Vegetationally based patterns of snow depth, density, and water equivalent were identified by using snow course, grid, and unaligned random sample measurements. The limitations of extrapolations from point measurements to general characteristics of regional snow cover were discussed for an area in which midwinter melt is a feature of snow evolution. The snow cover of the vegetation zones was most distinct in terms of water equivalent and least distinct in terms of density. Measurements of depth proved to have a high predictive value for water equivalents. The validity of generalizations from point measurements, even in terms of quite coarse measures of snow cover characteristics, is limited in such areas to a short period following the time of measurement. (Sims-ISWS)
W77-04883

WATER DRAG ON ARCTIC SEA ICE,
McGill Univ., Montreal (Quebec). Ice Research Project.
K. Shirasawa, and M. P. Langleben.
Journal of Geophysical Research, Vol. 81, No. 36, p 6451-6454, December 20, 1976. 4 fig, 1 tab, 9 ref.

Descriptors: *Sea ice, *Arctic, *Drag, On-site investigations, Data processing, Instrumentation, Currents(Water), Friction, Fluid friction, Stress, Time series analysis, Ice, Ice-water interfaces, Oceanography, *Canada.
Identifiers: Drag coefficient, Ice drag, Water drag, Robeson Channel(NWT).

A three-component ultrasonic current meter was used to obtain measurements of current fluctuations in the frictional boundary layer under an ice cover in Robeson Channel, Northwest Territories, Canada, during July 1974. The Reynolds stress against the underside of the ice floe was computed by a time series analysis of the correlation between downflow and vertical fluctuations of current. The average water drag coefficient, referred to a depth of 1 m below the ice and based on six runs in which the mean current was in the range between 12 and 32 cm/s, was 0.00105 with a probable error of + or - 0.00026. Two runs, made at very low current, yielded muchhigher values of drag coefficient but were thought to be in error. Spectra of current velocity fluctuations, plotted as a function of frequency, approached the -5/3 slope predicted by the Kolmogoroff law. Co-spectra showed no contribution to the momentum flux at frequencies above 1 Hz. (Sims-ISWS)
W77-04901

A SUBALPINE SNOWMELT RUNOFF MODEL,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2A.
W77-05000

2D. Evaporation and Transpiration

PREDICTION OF EVAPORATION FROM COLUMNS OF SOIL DURING ALTERNATE PERIODS OF WETTING AND DRYING,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2G.
W77-04764

THE APPLICABILITY OF PLANETARY BOUNDARY LAYER THEORY TO CALCULATE REGIONAL EVAPOTRANSPIRATION,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
W. Brutsaert, and J. A. Mawdsley.
Water Resources Research, Vol. 12, No. 5, p 853-858, October 1976. 4 fig, 40 ref. NSF GA-42569.

Descriptors: *Boundary layers, *Evapotranspiration, *Model studies, Evaporation, Transpiration, Water supply, Theoretical analysis, Mass transfer, Atmosphere, Atmospheric physics, Drought, Flood forecasting.
Identifiers: *Boundary layer theory, *Planetary theory, *Regional evapotranspiration, Uniform boundary layer, Rawinsonde, Atmospheric stability, Mass transfer formulae.

A formulation was obtained for the calculation of evapotranspiration from a region even when the water supply to the surface is limited. The theoretical model was based on general similarity principles for a steady, uniform boundary layer under any conditions of atmospheric stability. The resulting mass transfer formulae have the advantage that the necessary data (rawinsonde) are often routinely published or otherwise easily available. In contrast, most methods used for the determination of evapotranspiration require either a special experimental setup for rarely available data or are purely empirical and without a firm physical base. The proposed method could be applied in hydrologic simulation for drought studies and for the determination of antecedent moisture conditions in flood prediction. (Roberts-ISWS)
W77-04771

COMPUTATION OF SOLAR RADIATION FROM SKY COVER,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W77-04772

EVAPOTRANSPIRATION--SOME GROWTH AREAS,
Griffith Univ., Nathan (Australia). School of Australian Environmental Studies.
C. W. Rose.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975, p 83-94, March 1976. 11 fig, 32 ref.

Descriptors: *Evapotranspiration, *Soil water movement, *Evaporation, *Transpiration, *Soil-water-plant relationships, Soil moisture, Range management, Watersheds(Basins), Model studies, Hydrologic equations, Land use, Land management.
Identifiers: Isothermal evaporation, Lumped-parameter model.

Methods are described for determining evaporation from essentially bare soil and for simulating transpiration from single or isolated plants. Also discussed are methods of studying the effects of land use or management changes on watershed hydrology and the problem of predicting soil drying from meteorological screen measurements. Evaproation from areas such as range catchments may be estimated by measuring profiles of volumetric soil water content over a given time period and applying the principle of mass conservation of water to the volume of soil between unit area of the soil surface and the depth of measurement. The isothermal theory of water fluxes is used to show how evaporation from a homogeneous soil can be estimated from measurements of soil surface water content. Browse shrubs and trees in arid rangelands are often spaced such that they may be considered as single or isolated plants. Transpiration from these plants can be measured by a simple lumped-parameter model for water transport from soil to atmosphere through a single plant. Equations are provided these and other models. (Jahns-Arizona)
W77-04777

ON THE ROLE OF SOIL MOISTURE HYSTERESIS IN THE SUPPRESSION OF EVAPORATION FROM BARE SOIL UNDER DIURNALLY CYCLIC EVAPORATIVITY,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
D. Hillel.
Soil Science, Vol. 122, No. 6, p 309-314, December 1976. 4 fig, 1 tab, 15 ref.

Descriptors: *Evaporation, *Soil moisture, *Hysteresis, *Model studies, Evaporation control, Mathematical models, Soils, Cycles, Diurnal, Drying, Soil science.
Identifiers: *Moisture hysteresis, *Soil moisture evaporation.

A dynamic simulation model of nonsteady isothermal evaporation under cyclic evaporativity was used to evaluate the possible influence of the hysteresis phenomenon on the rate and cumulative amount of moisture loss and on the distribution of moisture in the soil surface zone. The esults support the hypothesis that the hysteresis effect can cause an appreciable reduction of evaporation in comparison with the nonhysteretic condition. (Sims-ISWS)
W77-04886

INFILTRATION THROUGH SOIL WITH A SLIGHTLY PERMEABLE BURIED MEMBRANE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-04887

2E. Streamflow and Runoff

WHY SIMULATION,
R. K. Linsley.
Simulation Network Newsletter, (Hydrocomp), Vol 8, No 5, p 1-4, September, 1976.

Descriptors: *Analytical techniques, *Model studies, *Hydrology, *Storm runoff, *Time, Infiltration, Hydrographs, Watersheds(Basins), *Simulation analysis.

The advantages of simulation techniques were discussed as applied to hydrology. Beginning in 1960, it was found that simulation programs could, with past data as background, allow the extrapolation of conditions beyond the range of observed data in storm runoff studies. Previous 'pencil' calculations were only approximations which were time consuming as well as being unable to use time intervals of less than 6 hours which would more accurately deal with infiltration and hydrograph characteristics of small watersheds. Simulation produces a more complete answer; allows adjustments for change which are not effective with conventional methods; has, generally, a time and cost advantage over conventional methods; and data is easily obtained on magnetic tape from the Climatic Data Service or the Geological Survey. Simulation, however, is not competitive with the use of empirical formulae for design flow computations. (Collins-FIRL)
W77-04725

SIMPLIFIED METHODS OF COMPUTING THE QUANTITY OF URBAN RUNOFF,
Water Resources Engineers, Inc., Springfield, Va.
R. P. Shubinski.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 200-213. 7 fig, 4 tab, 2 ref.

Descriptors: *Analytical techniques, *Rainfall intensity, *Runoff, *Urban runoff, *Peak discharge, Storm runoff, Storm water, Drainage systems.
Identifiers: Peak storm flow.

Regional flood-frequency relations were developed for 40 non-urban watersheds in the San Francisco Bay area by means of multiple regression. The regression equations were developed for basins larger than 5 sq mi under essentially non-urban conditions, and increasing urbanization will tend to change the coefficients and exponents. The rational method is based on the equation setting the maximum runoff rate equal to the product of a runoff coefficient representing the effects of rainfall losses, the average intensity of rainfall for the travel time, and the drainage area. The method's two principal assumptions are that the maximum runoff rate occurs when the entire area is contributing flow and the maximum rate of rainfall occurs during the time of concentration and the design rainfall depth during the time of concentration can be converted to an average rainfall intensity. The unit hydrograph (UH) is based on the assumption that the ordinates of a direct runoff hydrograph are proportional to the ordinate of the UH times the rainfall excess in a given time interval. Using the UH involves derivation of the UH for specified duration and application to a given rainfall event to determine the corresponding hydrograph of direct runoff. Computation of rainfall excess is based on known rainfall rates and estimates of losses. The UH can be used in comprehensive watershed simulation to evaluate the hydrologic effects of urbanization and costs of required drainage facilities. (See also W77-04730) (Snyder-FIRL)
W77-04736

THE WRE STORM MODEL,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.

W77-04737

THE EPA STORMWATER MANAGEMENT MODEL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W77-04738

SELECTED CASE STUDIES USING STORMWATER MANAGEMENT MODELS -- QUANITITY ASPECTS,
Orlob (G. T.), and Associates, Orinda, Calif.
G. T. Orlob.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 250-268. 15 fig, 6 ref.

Descriptors: *Analytical techniques, *Rainfall intensity, *Computer programs, *Runoff, *Urban runoff, Peak discharge, Storm water, Storm runoff.
Identifiers: Peak storm flow, Storm Water Management Model(SWMM).

Investigations of Northwood Tract, Baltimore, Maryland; Pegel T1/T2, Hamburg, Germany; View Ridge, Seattle, Washington; Vine Street, Melbourne, Australia; and a special study of stability problems are used to illustrate application of the Storm Water Management Models. Observed and simulated runoff peaks were not coincident in time. Watershed yields disagreed. The simulated runoff pattern tended to be smoother and more attenuated than that observed. Simulated runoff was discontinuous. Sometimes initial peaks were not well simulated although subsequent peaks were, and vice versa. The computer runoff for Hamburg compared well with the measured flow for a storm with two distinct precipitation peaks. The model gave a good account of the peak flow for the View Ridge catchment, but was a bit too low in the trailing portion of the storm. The SWMM proved superior in a comparison with models developed by England's Road Research Laboratory and the University of Cincinnati for Melbourne. Often it is difficult to distinguish numerically induced oscillations from hydraulic behavior that sometimes produces real fluctuations. Numerically induced oscillations can often be eliminated by changes in time step, averaging, or computational techniques. (See also W77-04730) (Snyder-FIRL)
W77-04740

COMPARATIVE ANALYSIS OF URBAN STORMWATER MODELS,
Battelle Pacific Northwest Lab., Richland, Wash.
For primary bibliographic entry see Field 5B.
W77-04743

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 1. MATHEMATICAL SOLUTIONS,
New Mexico Inst. of Mining and Technology, Socorro.
B. Sherman, and V. P. Singh.
Water Resources Research, Vol. 12, No. 5, p 889-896, October 1976. 10 fig, 16 ref, 3 append.

Descriptors: *Model studies, *Mathematical models, *Overland flow, *Distribution systems, Hydrologic systems, Infiltration, Agricultural watersheds, Watersheds(Basins), Hydrology.
Identifiers: Kinematic wave theory, Composite section models, Cascade model.

In models for overland flow based on kinematic wave theory, the friction parameter is assumed to be constant. This paper reported a study of a converging geometry which allows continuous spatial variability in the parameter. Parameter variability results in a completely distributed approach, reduces the need to use a complex network model to simulate watershed surface runoff, and saves much computational time and effort. This paper was the first in a series of three. It developed analytical solutions for a converging geometry with no infiltration and with temporally constant lateral inflow. Part 2 discussed the effect of infiltration on the runoff process, and part 3 discussed application of the proposed model to natural agricultural watersheds. (See also W77-04745) (Lee-ISWS)
W77-04744

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 2. EFFECT OF INFILTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W77-04745

A NOTE ON LONG WAVES IN SHALLOW CHANNELS WITH RUNNING WATER,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
T. Green.
Water Resources Research, Vol. 12, No. 5, p 1025-1028, October 1976. 3 fig, 8 ref.

Descriptors: *Waves(Water), *Channel flow, *Model studies, Mathematical models, Channels, Flow, Velocity, Friction, Flow characteristics, Open channel flow, Streamflow, Mathematical studies, Running waters, Hydraulics.
Identifiers: Long waves.

Long waves moving upstream in a channel with nonuniform cross-channel depth and current distributions were determined for cases in which wave advection due to the current is approximately balanced by wave refraction due to varying water depth. An expansion based on this balance was introduced, which can be carried to any desired order. The method was shown to apply in wide, shallow channels. (Sims-ISWS)
W77-04752

WATER TEMPERATURE FORECASTING AND ESTIMATION USING FOURIER SERIES AND COMMUNICATION THEORY TECHNIQUES,
Tennessee Technological Univ., Cookeville. Dept. of Mathematics.
L. L. Long.
Water Resources Research, Vol. 12, No. 5, p 881-887, October 1976. 11 fig, 2 tab, 9 ref.

Descriptors: *Water temperature, *Analytical techniques, *Regression analysis, *Fourier analysis, Model studies, Mathematical models, Temperature, Rivers, Forecasting, Time series analysis, Statistics, Statistical methods, Mathematics.
Identifiers: *Stream temperature forecasting.

Fourier series and statistical communication theory techniques were utilized in the estimation of river water temperature increases caused by external thermal inputs. An example estimate, assuming a constant thermal input, was demonstrated. A regression fit of the Fourier series approximation of temperature was then used to forecast daily average water temperatures. Also, a 60-day prediction of daily average water temperature was made, with the aid of the Fourier regression fit, by using significant Fourier components. (Sims-ISWS)
W77-04774

BIG THOMPSON CANYON FLASH FLOOD OF JULY 30-AUGUST 1, 1976. A REPORT TO THE ADMINISTRATOR.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2B.
W77-04833

ON THE PRECISION OF SALT DILUTION GAUGING,
Geological Survey of Canada, Ottawa (Ontario).
T. J. Day.
Journal of Hydrology, Vol 31, No 3/4, p 293-306, December 1976. 3 fig, 4 tab, 18 ref.

Descriptors: *Tracers, *Streamflow, *Salts, Velocity, *Discharge(Water), Analytical techniques, Sampling, On-site investigations, Equipment, Channels, Hydrology, Hydraulics.
Identifiers: *Salt dilution gauging, Relative salt dilution, Probable errors.

The results of an extensive series of dilution experiments in four steep, gravel streams (409 individual slug injections representing 39 separate flow events) were presented. Precision of four pertinent parameters, tracer integral, mean velocity, discharge, and flow area, expressed as per cent probable error about the mean, was investigated. Individual errors range from 1 to 21% with median values ranging from 4.7 to 7.3% and modal errors ranging from 3.6 to 6.8%, depending upon the derived parameter. (Sims-ISWS)
W77-04875

CLASSIFICATION OF NESTED TRIBUTARY BASINS IN ANALYSIS OF DRAINAGE BASIN SHAPE,
State Univ. of New York at Buffalo. Dept. of Geography.
R. S. Jarvis.
Water Resources Research, Vol. 12, No. 6, p 1151-1164, December 1976. 6 fig, 6 tab, 21 ref.

Descriptors: *Watersheds(Basins), *Drainage patterns(Geologic), *Tributaries, Drainage, Dendritic, Streams, River systems, River basins, Surface drainage, *Fourier analysis, Analytical techniques, Classification.
Identifiers: *Drainage basin shape, Stream morphology.

Tributary basins in Strahler-ordered drainage systems may be classified as order w formative or order w excess, according to whether the order w mouth stream outflows into a stream of order equal to or greater than w. This classification distinguishes spatial nesting among tributary basins, formative tributaries locating farther from the main basin mouth than excess tributaries. Basin shape was analyzed by using standard indices and by applying the method of unrolling perimeter radials for Fourier series analysis. The empirical results from 336 drainage shapes demonstrated differentiation of basin shapes among geomorphologic environments, between basin order levels 3 and 4, and between formative and excess tributary basin types at the order 3 level. The order level contrasts indicate scale dependency in drainage basin shapes, and the tributary order type contrasts suggest spatial nesting controls such that basins sampled solely by Strahler order level are not homogeneous with regard to shape properties. (Sims-ISWS)
W77-04880

DETERMINATION OF CHANNEL CAPACITY OF THE SACRAMENTO RIVER BETWEEN ORDBEND AND GLENN, BUTTE AND GLENN COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. G. Simpson.
Open-file report 76-526, November 1976. 48 p, 3 fig, 3 tab, 4 ref.

Descriptors: *Channel flow, *River flow, *Floods, *Flood peak, *Flood control, Levees, Flood data, Flood flow, *California, Hydrologic data, Evaluation.
Identifiers: *Sacramento River(Calif), *Channel capacity.

The adequacy of an 8.5-mi reach of the Sacramento River to carry flood flows is evaluated. The reach studied is in Butte and Glenn Counties, California, and extends northward from the present east-bank Sacramento River Flood Control Project levee near Glenn upstream to the Ord Ferry gaging station near Ordbend. There is a west-bank levee throughout the study reach. Flows analyzed range from 11,500 to 265,000 cfs. Computed water-surface elevations are based on topography obtained during September through November 1974. The present Sacramento River Flood Control Project levees at the downstream end of the study reach near Glenn are designed to contain flows up to 150,000 cfs. Water-surface elevations computed for flows of this magnitude are about 6 to 8 ft below the top of the existing west-bank levee throughout the study reach. (Woodard-USGS)
W77-04977

DISTRIBUTION FUNCTIONS FOR STATISTICS DERIVED FROM BIVARIATE NORMAL AND BIVARIATE TWO-PARAMETER LOG-NORMAL POPULATIONS,
Geological Survey, Reston, Va. Water Resources Div.
J. R. Slack, J. R. Wallis, and N. C. Matalas.
Open-file report 76-214, February 1976. 22 p, 8 fig, 3 tab, 4 ref.

Descriptors: *Distribution, *Statistical methods, *Forecasting, *Hydrology, *Regional flood, Stochastic processes, Time series analysis, Monte Carlo method, Probability, Regional analysis.
Identifiers: *Sensitivity analysis.

The distribution functions for hydrologic statistics that may be used to assess the significance of differences between sample means, standard deviations, coefficients of skewness, and coefficients of variations are obtained by Monte Carlo experiments. The distributions are expressed as functions of sample size, cross correlation, and skewness. In general, the distributions are more sensitive to cross correlation than to skewness. As sample size increases, however, the distributions tend to become more sensitive to skewness. (Woodard-USGS)
W77-04978

RELATION OF EROSION TO SEDIMENT YIELD,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04986

DETERMINING SUSPENDED SEDIMENT LOADS FROM TURBIDITY RECORDS,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04988

BEDLOAD TRANSPORT IN TWO LARGE, GRAVEL-BED RIVERS, IDAHO AND WASHINGTON,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04990

PREDICTION OF SEDIMENT YIELDS IN WISCONSIN STREAMS,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04991

A SUBALPINE SNOWMELT RUNOFF MODEL,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2A.
W77-05000

RAINFALL-RUNOFF MODELS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05010

GENERATION OF SYNTHETIC FLOW SEQUENCES,
Geological Survey, Washington, D.C.
N. C. Matalas, and J. R. Wallis.
In: Systems Approach to Water Management, (Ed. by Asit K. Biswas), p 54-79 (Chapter 3), McGraw-Hill, Inc., New York, N.Y., 1976. 6 tab, 32 ref.

Descriptors: *Synthetic hydrology, *Systems analysis, *Mathematical models, Streamflow, Statistics, Markov processes, Water resources, Design, Constraints, Operations, Equations.
Identifiers: Lag-one model, Fractional noise model, Flow distribution, Model inconsistency, Statistical bias, Incomplete data sets.

The authors of this chapter assert that the design of a water resource system is dependent, in part, upon sequences of streamflow that are assumed to be realized over the system's economic life. Unfortunately, the generating mechanism of streamflow is unknown, but this mechanism can be approximated, and an ensemble of 'future' flow sequences--synthetic flow sequences, can be generated. During the past ten years, a series of techniques has been developed for generating synthetic flow sequences, most of which have been based on short-memory processes. However, recent developments enable planners to introduce long-memory processes to approximate long-term persistence that is evident in many historical flow sequences. The developments in this area thus far are reviewed herein. Special attention is given to some of the operational problems involved in generating synthetic flow sequences on a multisite and multiseason basis, including those which derive from the paucity of streamflow data, as well as those that derive from the operational constraints of model building. (See also W77-05008) (Bell-Cornell)
W77-05011

2F. Groundwater

HYDROMINERAL DEPOSITS AT VOLVIC, (IN FRENCH),
For primary bibliographic entry see Field 2K.
W77-04656

WASTEWATERS IN THE VADOSE ZONE OF ARID REGIONS: HYDROLOGIC INTERACTIONS,
For primary bibliographic entry see Field 5B.
W77-04754

PERIODIC SOLUTIONS OF A NONLINEAR DIFFUSION EQUATION USED IN GROUNDWATER FLOW THEORY: EXAMINATION USING A HELE-SHAW MODEL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, and A. N. Stokes.
Journal of Hydrology, Vol. 31, No. 1/2, p 27-35, September 1976. 5 fig, 10 ref.

Descriptors: *Model studies, *Diffusion, *Equations, *Groundwater movement, Hydraulic conductivity, Dupuit-Forchheimer theory, Frequency, Water levels, Tidal effects, Aquifers, Inflow, Discharge(Water).
Identifiers: *Hele-Shaw models, Sinusoidal oscillation, Philip theory, Poisseville theory.

A Hele-Shaw experiment which models groundwater flow was described. The experiment confirmed the Philip prediction that in steady periodic nonlinear diffusion, the root mean square of the oscillation, rather than the mean, is constant. For the nonlinear case examined, however, it was found that the logarithm of the amplitude of the oscillation still diminishes in proportion to x divided by square root of T, so, from a practical viewpoint, the hydrological problem could be treated as a linear one provided the displaced mean were taken into account. The anomalous appearance and subsequent decay of harmonics in the initially sinusoidal wave were discussed. (Visocky-ISWS)
W77-04761

MOVEMENT OF SUBTERRANEAN WATERS IN THE ECOSYSTEM OF THE AMAZONIAN CAMPINA, (IN PORTUGESE),
Centro de Energia Nuclear na Agriculture, Sao Paulo (Brazil). Dept. of Physics and Meteorology.
K. Reichardt, A. Dos Santos, V. F. Do Nascimento, F. Bacchi, and O. O. S. Bacchi.
Acta Amazonica 5(3), p 287-290, 1975.

Descriptors: *Ecosystems, South America, *Groundwater movement, Tracers, Permeability, Nutrients, Tritium, *Subsurface waters, *Saturated flow.
Identifiers: *Brazil(Campina Amazonica).

In the period of Dec. 1974-Jan. 1975 the movements of the groundwater in the ecosystem of the Campina Amazonica (Brazil) was studied. The saturated flux of the groundwater was studied by 2 methods: applying Darcy's equation and using a tracer of 3H (100 mCi) in the form of 3H2O. The variations shown by the 2 methods are derived from the high permeability of the arenaceous soil and influenced by precipitation. The results obtained through the 2 methods are the same magnitude. They indicate the existence of horizontal movement in the saturated flux of the groundwater of the order of 0.0018 cm3.cm-2.h-1.--Copyright 1976, Biological Abstracts, Inc.
W77-04773

SOIL WATER MOVEMENT: INFILTRATION, REDISTRIBUTION, AND GROUNDWATER MOVEMENT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 2G.
W77-04776

OPTIMAL PUMPING REGIMES IN AN UNCONFINED COASTAL AQUIFER,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W77-04873

MOVEMENT OF POLLUTANTS IN A TWO-DIMENSIONAL SEEPAGE FLOWFIELD,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-04876

QUANTITATIVE EVALUATION OF A METHOD FOR ESTIMATING RECHARGE TO THE DESERT BASINS OF NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
P. Watson, P. Sinclair, and R. Waggoner.
Journal of Hydrology, Vol 31, No 3/4, p 335-357, December 1976. 10 fig, 5 tab, 7 ref, 1 append.

Descriptors: *Recharge, *Groundwater, *Deserts, *Nevada, Hydrology, Watersheds(Basins), Water balance, Infiltration, Wells, Groundwater recharge.

Identifiers: *Desert basins, *Maxey-Eakin method, Influent-effluent streams, Statistical analyses, Multiple linear regression.

The Maxey-Eakin method for estimating recharge to groundwater basins in Nevada is investigated, the objective being to determine whether or not a statistically rational basis exists for its use. The major assumption of this tudy was that the groundwater discharge within a basin can be equated to the groundwater recharge (i.e., hydrologic equilibrium exists). Within the first 58 reports of the Nevada Ground-Water Resources--Reconnaissance Series, there are a total of 212 hydrologic basins represented. However, because of certain inadequacies, data from only 63 basins could be used in this study. Multiple-linear regression was used as the closest approximation to the techniques of Maxey and Eakin. Simple-linear regresssions were also used to generate six predictive equations which are similar in principle to Maxey and Eakin's method. It is clear from the variability of the coefficients of the seven predictive equations, including Maxey and Eakin's, that none of them can be used to reliably predict recharge. However, they can be used as first approximations of recharge. (Lee-ISWS)
W77-04878

A SINGLE-POTENTIAL SOLUTION FOR REGIONAL INTERFACE PROBLEMS IN COASTAL AQUIFERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
O. D. L. Strack.
Water Resources Research, Vol 12, No 6, p 1165-1174, December 1976. 11 fig, 15 ref.

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Aquifers, *Coasts, Groundwater, Groundwater movement, Model studies, Mathematical models, Sea water, Equations, Wells, Water wells, Brackish water, Interfaces, Subsurface waters.
Identifiers: *Coastal aquifers.

An analytic technique for solving three-dimensional interface problems in coastal aquifers was presented. Restriction was made to cases of steady state flow with homogeneous isotropic permeability where the vertical flow rates can be neglected in relation to the horizontal ones. The aquifer was divided into zones defined by the type of flow occurring. These types of flow may be either confined, unconfined, confined interface, or unconfined interface flow, where the interfaces separate freshwater from salt water at rest. The technique is based upon the use of a single potential which is defined throughout all zones of the aquifer. The potential is single valued and continuous throughout the multiple-zone aquifer, and its application does not require that the boundaries between the zones be known in advance. The use of the single-valued potential was illustrated for an analytic technique, but it may be used with some advantage in numerical methods such as finite difference or finite element techniques. Applications discussed involve two interface flow problems in a shallow coastal aquifer with a fully penetrating well. The first problem is one of unconfined interface flow where the upper boundary is a free water table. The second is one of confined interface flow where the upper boundary is horizontal and impervious. Each problem involves two zones. One zone is adjacent to the coast and is bounded below by an interface between freshwater and salt water at rest. The other zone is bounded below by an impervious bottom. (Sims-ISWS)
W77-04881

A NUMERICAL STUDY OF CONFINED-UNCONFINED AQUIFERS INCLUDING EFFECTS OF DELAYED YIELD AND LEAKAGE,
Kansas State Geological Survey, Lawrence.
C. Ehlig, and J. C. Halepaska.
Water Resources Research, Vol 12, No 6, p 1175-1183, December 1976. 13 fig, 13 ref.

Descriptors: *Groundwater, *Aquifers, *Model studies, Mathematical models, Pumping, Drawdown, Confined water, Wells, Water wells, Hydraulic conductivity, Water yield, Leakage, Transmissivity, Permeability, Groundwater movement.
Identifiers: *Confined-unconfined aquifers.

A numerical model is presented in radial coordinates for a well penetrating a homogeneous isotropic aquifer of constant thickness. The model defined variations in the transmissivity and effective storage coefficient as functions of the potential. This allowed an approximation for the problem of a well pumping in an initially confined system, which becomes unconfined near the well as the potential surface drops below the confining layer of the aquifer (confined-unconfined problem). The model was used to investigate effects of delayed yield and leakage confined-unconfined aquifers. Drawdown versus time curves were presented for a variety of boundary conditions. Results showed that the conditions producing an inflection in the drawdown versus curves are not unique and illustrates the difficulty in attempting to determine aquifer characteristics from pumping test. (Sims-ISWS)
W77-04882

INJECTION/EXTRACTION WELL SYSTEM--A UNIQUE SEAWATER BARRIER,
Brown and Caldwell, Pasadena, Calif.
For primary bibliographic entry see Field 4B.
W77-04888

QUANTIFYING THE NATURAL FLUSHOUT OF ALLUVIAL AQUIFERS,
Engineering Enterprises, Inc., Norman, Okla.
For primary bibliographic entry see Field 5B.
W77-04889

WATER LEVELS IN ARTESIAN AND NONARTESIAN AQUIFERS OF FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-04985

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY, CALIFORNIA,
Geological Survey, Sacramento, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-04992

LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Sacramento, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-04993

GROUND-WATER MODELS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
C. C. Kisiel, and L. Duckstein.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 80-155 (Chapter 4), McGraw Hill, Inc., New York, N.Y., 1976. 14 fig, 4 tab, 134 ref. OWRT-C-3259(No. 3708)(7).

Descriptors: *Groundwater, *Mathematical models, *Hydrology, Equations, Lakes, Aquifers, Wells, Annual, Streamflow, Stochastic processes, River basins, Water storage, Linear programming, Optimization, Constraints, Management, Pumping, Natural recharge, Artificial recharge, Chemicals, Pollutants, Economics, Water quality, Conjunctive use, Systems analysis, Simulation analysis.
Identifiers: Linear systems theory, Inverse problems, Adjustment algorithms, Criterion functions, Hybrid computations, Subjective calibrations, Automatic solution, Water extraction, Uncertainty, Multiobjective.

A comprehensive analysis of groundwater problems is presented. Identified is the current state of modeling, including its deficiencies. The focus is upon emerging approaches to describing and managing the groundwater system, not on the many theoretical and empirical solutions to regional and specialized ground water problems. Examples of specific methodologies are given. Various groundwater models are summarized, along with statement about their properties which should enable one to select a suitable methodology. A significant part of this chapter is relevant to problems other than groundwater: these are some of the important techniques and considerations, i.e., model choice, multilevel optimization, hybrid computations, adjustment algorithms, multiobjective features, multiobjective features, and fundamental problems such as uncertainties, error growth, worth of data, and economic losses. It is suggested that planners know enough about uncertainties to interpret their possible consequences. The chapter considers: (1) general systems framework; (2) general systems theory and groundwater hydrology, including a continuous systems model of a lake-aquifer system; (3) classical ground water equations and linear systems theory; (4) aquifers as finite state machines (FSM), including an example of FSM of well systems; (5) inverse problems; (6) extraction of water from an aquifer; (6) natural and artificial recharge; (7) chemicals and pollutants in an aquifer; (8) conjunctive operation of surface and ground water resources. (See also W77-05008) (Bell-Cornell)
W77-05012

2G. Water In Soils

INFILTRATION ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5B.
W77-04625

INFILTRATION OF WATER ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5B.
W77-04626

CONDUCTING A SEWER INFILTRATION/INFLOW SURVEY TO ELIMINATE 2 MGD,
Onondaga County Dept. of Drainage and Sanitation, Syracuse, N.Y.
J. M. Karanik, and P. C. Johnson.
Public Works, Vol. 107, No. 12, p 49-52, December, 1976. 1 fig.

Descriptors: *Infiltration, *Inflow, On-site investigations, *Sewers, Manholes, Sewage districts, Groundwater, Economics, New York, Waste water treatment.
Identifiers: Phase II infiltration inflow evaluation survey, Metropolitan Syracuse Sewage Treatment Plant, Precipitation data.

A Phase II infiltration/inflow evaluation survey identifies specific infiltration/inflow sources, determines their effect on treatment capacity, verifies cost-effective levels for elimination, and determines a program for sewer rehabilitation. Such a survey was undertaken of the tributary areas of the Metropolitan Syracuse Sewage Treatment Plant. The study area has a 300,000 population and contains 369 miles of separate sanitary sewers and 287 miles of combined stormwater and sanitary sewers. The plant is being expanded to a 80 mgd tertiary facility and the combined system overflows are evaluated for recommendations t

control and abate stormwater/sanitary overflows. The study was in three parts - separate system evaluation survey, combined system evaluation survey, and combined sewer overflow monitoring and abatement program. The second part of this program was described in detail. Four Major service areas were defined, divided into smaller subservice areas, and the data were combined to complete an overall data base. Manholes and sewer lines were assigned identification codes. Flow depth monitors were placed in key manholes and this data plus pipe sizes, slopes and sewer invert depth measurements were input into a computer. The computer was used to calculate flows for specific sections of sewer line, as well as general system flows. Groundwater and precipitation data were collected to determine their relationship to infiltration. A physical inspection program was conducted of manholes, the trunk sewer, and connecting branch sewers. Following a television inspection of sewers, a final cost-effective analysis will be performed to determine which points of infiltration and continuous inflow will be removed. (Collins-FIRL)
W77-04658

VIRUS MOVEMENT IN SOIL COLUMNS FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W77-04712

EFFECT OF MUNICIPAL LANDFILL LEACHATE ON MERCURY MOVEMENT THROUGH SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W77-04729

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 2. EFFECT OF INFILTRATION,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W77-04745

THE DIFFERENT FORMS OF MOISTURE PROFILE DEVELOPMENT DURING THE REDISTRIBUTION OF SOIL WATER AFTER INFILTRATION,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs, and A. Poulovassilis.
Water Resources Research, Vol 12, No. 5, p 1007-1012, October 1976. 7 fig, 18 ref.

Descriptors: *Infiltration, *Soil water movement, *Model studies, Mathematical models, Laboratory tests, Soil water, Soil moisture, Water spreading, Moisture content, Soils, Equations, Porous media, Percolation, Pervious soils, Soil physical properties.
Identifiers: Moisture profiles, Soil water redistribution.

Two different forms of moisture profile development may occur during the redistribution of soil water after infiltration. In one, the profile shape continues to be similar to that profile developed during the infiltration process, with a fairly uniform water content region near the soil surface above a steep wetting front; and the rate of redistribution is inversely related to the infiltration depth. In the other, water drains from near the surface to appear as a step in the moisture profile below the wetting front at the cessation of infiltration; and the rate of redistribution is directly related to infiltration depth. Classical theory of soil water movement was shown to account for both forms of moisture profile development, which depend on the moisture profile shape at the cessation of infiltration and on the soil water properties of the porous material. Experimental results of moisture profile development in a sand column illustrated how different profile forms develop as the depth of infiltration is increased and, by inclining the experimental column, how they depend on the relative importance of the soil water pressure head gradients compared with that of gravity. (Sims-ISWS)
W77-04749

INFILTRATION ANALYSIS AND PERTURBATION METHODS 2. HORIZONTAL ABSORPTION,
City Coll., New York. Dept. of Mathematics.
D. K. Babu.
Water Resources Research, Vol. 12, No. 5, p 1013-1018, October 1976. 1 fig, 1 tab, 12 ref, 1 append.

Descriptors: *Infiltration, *Absorption, *Mathematical studies, Equations, Theoretical analysis, Unsaturated flow, Diffusivity, Moisture content, Boundaries(Surfaces).
Identifiers: *Perturbation, Wetting front, Yolo clay.

Perturbation methods are employed to analyze the horizontal absorption of moisture in unsaturated soils. The reported study applied to absorption under the general diffusivity function, subject to constant boundary concentration. The concept of the wetting front moving with a finite velocity played a fundamental role in this set of papers. The solution emerges as a series of terms that can be explicitly calculated in terms of the integrals involving diffusivity functions. The examples of exponential and constant diffusivity functions, as well as the case of Yolo light clay, were computed to one or two terms to exhibit the advantages over, and the good agreement with, other published data of Parlange, Philip, etc. The method possesses great potential, and in a subsequent paper the study of vertical infiltration will be presented by utilizing the perturbation mechanism. (See also W76-08334 and W77-04751) (Visocky-ISWS)
W77-04750

INFILTRATION ANALYSIS AND PERTURBATION METHODS 3. VERTICAL INFILTRATION,
City Coll. New York. Dept. of Mathematics.
D. K. Babu.
Water Resources Research, Vol. 12, No. 5, p 1019-1024, October 1976. 3 fig, 1 tab, 7 ref.

Descriptors: *Infiltration, *Mathematical studies, *Unsaturated flow, Moisture content, Boundaries(Surfaces), Theoretical analysis, Equations, Velocity, Diffusivity, Permeability, Numerical analysis.
Identifiers: *Perturbation, Wetting front, Yolo clay.

Simple perturbation methods continue to yield good results in the solution of the problem of vertical infiltration of water into unsaturated soils. The initial approximation is valid for all times and gives useful information about important flow characteristics. The required computations are always direct and simple. Some numerical work pertaining to Yolo light clay was presented to exhibit the advantages, relevance, and simplicity of the present analysis compared to other existing works on this topic. (See also W76-08334 and W77-04750) (Visocky-ISWS)
W77-04751

WASTEWATERS IN THE VADOSE ZONE OF ARID REGIONS: HYDROLOGIC INTERACTIONS,
For primary bibliographic entry see Field 5B.
W77-04754

WASTEWATERS IN THE VADOSE ZONE OF ARID REGIONS: GEOCHEMICAL INTERACTIONS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2K.
W77-04755

DRAINAGE TO A WATER TABLE ANALYSED BY THE GREEN-AMPT APPROACH,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs, and S. Aggelides.
Journal of Hydrology, Vol. 31, No. 1/2, p 67-79, September 1976. 8 fig, 10 ref.

Descriptors: *Drainage, *Water table, *Equations, *Soils, *Infiltration, *Porous media, Flow rates, Laboratory tests, Saturated soils, Hydraulic conductivity, Soil moisture, Capillary fringe, Graphical analysis.
Identifiers: *Green-Ampt analysis, *Sand columns.

By means of the Green-Ampt analysis, it was shown that the drainage from an initially saturated column of porous material, after the water table is suddenly lowered to a given level from the surface on which infiltration is maintained at a rate, q, during the drainage, may be described to a good approximation by the equation: 1 - Q'/Q' sub infinity = exp (- (F -q)t/Q' sub infinity), where Q' and Q' sub infinity are the quantities of water drained at time, t, and at infinite time, respectively, and F is the initial flow rate from the column. Experimental confirmation of this equation was obtained with measurements of the drainage from a sand column. Experiments also showed that the equation described the drainage from a column when a steady infiltration rate on the surface was changed to a lower one, although the Green-Ampt analysis could not be applied to this case. The Green-Ampt approach was also used, with supporting experimental results from a sand column, to estimate the drainage from a column of porous material with a moving water table. This analysis was applied to investigate the delayed yield effect during the water table drawdown over a field drainage installation. (Visocky-ISWS)
W77-04762

AN ELECTRICAL CONDUCTIVITY PROBE FOR DETERMINING SOIL SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Rhoades, and J. van Schilfgaarde.
Soil Science Society of America Journal, Vol. 40, No. 5, p 647-651, September-October 1976. 4 fig, 2 tab, 7 ref.

Descriptors: *Saline soils, *Electrical conductance, *Instrumentation, *Equipment, Soil properties, Irrigation, Salts, Electrical equipment, Soils, Salinity, Soil science, *Salinity.

An electrical conductivity probe for determining soil salinity was described, including construction details. The probe's utility for measuring soil salinity within discrete soil depth intervals was illustrated with examples. Using the salinity probe, the Barnes method for estimating electrical conductivity profiles was shown to be accurate for soils that are reasonably homogeneous laterally. (Sims-ISWS)
W77-04763

PREDICTION OF EVAPORATION FROM COLUMNS OF SOIL DURING ALTERNATE PERIODS OF WETTING AND DRYING,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
W. J. Staple.
Soil Science Society of America Journal, Vol. 40, No. 5, p 756-761, September-October 1976. 7 fig, 1 tab, 22 ref.

Descriptors: *Evaporation, *Soils, *Soil properties, Infiltration, Laboratory tests, Model studies, Hydraulic conductivity, Drying, Wetting, Soil moisture, Soil water movement, Loam, Soil water, Soil science.

This analysis was undertaken to test certain approximations in using finite difference methods to compute evaporation and soil water conservation. Analysis of four evaporation experiments showed that water movement in Wood Mountain clay loam was sufficiently repeatable during wetting and drying to permit computation of evaporation losses on the basis of predetermined soil properties. The experiments involved evaporation after the following treatments: (1) infiltration penetrating partway down columns of air-dry soil; (2) infiltration and 7 days' redistribution; (3) treatment (2) plus additional infiltration; and, (4) repeated infiltration applied at different stages of initial drying. In computing evaporation, the Richards and Dalton flow equations were used with soil and atmospheric parameters. Temperature gradients in the soil were neglected. Hydraulic conductivity of the surface layers of soil were adjusted empirically to estimate combined liquid and vapor movement and to correct for disruptive effects such as dispersion, air blockage, and swelling near the surface. The independent domain theory was used to estimate the influence of hysteresis on capillary pressures during alternate wetting and drying. Agreement between measured and computed evaporation was satisfactory following infiltration, except when water was added after more than 7 days' evaporation. (Sims-ISWS)
W77-04764

PREDICTING SPECIFIC CONDUCTANCE AND SALT CONCENTRATION IN DILUTE AQUEOUS SOLUTIONS,
California Univ., Berkeley.
G. M. Marion, and K. L. Babcock.
Soil Science, Vol. 122, No. 4, p 181-187, October 1976. 2 fig, 5 tab, 15 ref.

Descriptors: *Aqueous solutions, *Salts, *Soils, *Electrical conductance, Ions, Anions, Cations, Model studies, Mathematical models, Chemistry, Correlation analysis, Laboratory tests, Analytical techniques.
Identifiers: *Specific conductance, Soil suspensions, River water, Soluble salts, Concentration.

The use of a modified Onsager-Fuoss equation for predicting the specific conductance of dilute mixed salt solutions was evaluated. Corrections were made for the presence of ion-pairs in solution. Reasonable agreement was found between measured and calculated specific conductance (+ or - 8%). The modified Onsager-Fuoss equation can be applied to dilute aqueous solutions without special calibration of the equation for given experimental data. This is an advantage over earlier models for predicting the specific conductance of mixed salt solutions. Empirical equations were derived which related measured specific conductance and solution salt concentration. (Sims-ISWS)
W77-04765

THEORETICAL ANALYSIS OF WETTING FRONT INSTABILITY IN SOILS,
Connecticut Agricultural Experiment Station, New Haven.
J. -Y. Parlange, and D. E. Hill.
Soil Science, Vol. 122, No. 4, p 236-239, October 1976. 13 ref.

Descriptors: *Infiltration, *Soil moisture, *Theoretical analysis, *Wetting, Soil physics, Porous media, Velocity, Soil properties, Analysis, Diffusivity, Soil texture, Unsaturated flow.
Identifiers: *Wetting fronts, Fingering, Instability.

A wetting front moving in a homogeneous soil at sufficiently low speed is unstable. Assuming that the perturbed front speed is affected by its curvature, the dependence of the most unstable wave length on soil properties was determined exactly. It was found that this wave length should be larger for fine-textured soils than for coarse-textured soils, and also that it should be larger when the initial moisture content increases. (Adams-ISWS)
W77-04768

MOVEMENT OF WATER AND NITRATE IN AN UNSATURATED AGGREGATED SOIL DURING NONSTEADY INFILTRATION--A SIMPLIFIED SOLUTION FOR SOLUTE FLOW,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 5B.
W77-04769

THE PULSED IRRIGATION PRINCIPLE FOR CONTROLLED SOIL WETTING,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
B. Zur.
Soil Science, Vol. 122, No. 5, p 282-291, November 1976. 8 fig, 10 ref.

Descriptors: *Irrigation, *Infiltration, *Soil moisture, Laboratory tests, Application methods, Rates of application, Irrigation practices, Moisture content, Soils, Wetting, Water utilization, Irrigation efficiency, Agriculture.
Identifiers: *Pulsed irrigation, Wetting fronts.

The pulsed water application principle was developed in order to obtain the desired low application rates from any water emitter. A time averaged hourly water application rate was used to define the pulsed water application regime. In a series of controlled laboratory experiments, water was applied to soil columns at various combinations of nominal application rates and pulse duration. The volumetric soil water content distribution and the rate of advance of the wetting front in the soil columns behaved as if the time averaged water application rate were being applied continuously. The water pulses applied at the soil surface are quickly damped, resulting in an essentially constant water flow through the wetted soil profile. It was concluded that the pulsed water application principle can be used effectively to control the wetting of the soil profile during the infiltration process. (Sims-ISWS)
W77-04770

PERCOLATION AND STREAMFLOW IN RANGE AND FOREST LANDS,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz.
A. R. Hibbert.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975, p 61-72, March 1976. 8 fig, 64 ref.

Descriptors: *Percolation, *Streamflow, *Soil water movement, *Ranges, *Forests, *Infiltration, Land use, Forest fires, Wettability, Rainfall simulators, Storm runoff, Subsurface water, Permeability, Range management.

Movement of water into and through soils in range and forest lands is discussed, including such processes as infiltration, percolation, subsurface generation of streamflow, and the effects of fire, grazing, and other land use practices on infiltration. Water enters the soil whenever the driving force exceeds resistance to wetting and movement of water. Normally, the driving force is water's downward adsorption to soil particles by capillary action, plus gravity. Other possible means of infiltration are described, along with inhibiting factors such as decreased porosity. Use of rainfall simulators is the best method for field evaluation of infiltration. Nonwettability or water repellency is a major cause of poor infiltration in certain soils, especially chaparral lands. Forest fires can cause repellency and reult in erosion and flooding. Methods for measurement of soil water movement are discussed. Also oultined is the function of local subsurface water systems in the generation of streamflow in steep headwater catchments, including the mechanism of stormflow generation from rainfall on upstream areas. (Jahns-Arizona)
W77-04775

SOIL WATER MOVEMENT: INFILTRATION, REDISTRIBUTION, AND GROUNDWATER MOVEMENT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
T. Talsma.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975, p 73-82, March 1976. 8 fig, 4 tab, 32 ref.

Descriptors: *Soil water movement, *Infiltration, *Groundwater movement, Drainage, Equations, Mathematical models, Sorption, Soil types, Hydraulic conductivity, Hysteresis, Permeability, *Distribution.
Identifiers: *Redistribution, Soil swelling.

Infiltration behavior and the distribution of infiltrated water from initially wetted soil layers are outlined; test results are presented to confirm predicted differences in infiltration behavior between swelling and non-swelling soils. Redistribution problems are discussed using numerical solutions of an equation for water transport in non-swelling soils; deep drainage to groundwater is treated using a water balance model. Infiltration in rigid soils is compared to that in swelling soils, heterogeneous soils, and other boundary conditions. Methods for measuring sorptivity and hydralic conductivity are presented. The prediction of soil water redistribution after rain or ponded water disappears from the surface is basically a study of hysteresis. At first, drainage at different depths in the initially wetted profile starts along various scanning curves depending on moisture content. The rate of distribution depends on initial moisture content as well as the amount of applied water. The influence of evaporation and transpiration is also accounted for. Two studies of the overall magnitude of drainage in a catchment, using a water balance method, are presented. (Jahns-Arizona)
W77-04776

GYPSUM REQUIREMENT OF SODIC SOILS AND WATERS,
New South Wales Dept. of Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.
A. Awad, and T. S. Abbott.
Agricultural Gazette of New South Wales, Vol. 87, No. 2, p 55-57, April, 1976.

Descriptors: *Gypsum, *Alkaline soils, *Irrigation water, *Alkaline water, Calcium compounds, Soil types, Irrigation, Sodium, Sodium compounds, Calcium, *Saline water, Lime, Plant growth, Leaching, Magnesium compounds, Ions, Soil management.

A problem often encountered in irrigated areas is sodicity of waters and soils. This refers to a high concentration of sodium ions relative to calcium and magnesium ions. A common method of reducing high sodium levels is to apply gypsum, a source of calcium ions. The means of determining the correct amount of gypsum to apply to sodic waters and soils is discussed. If irrigation water is sodic, gypsum can be applied to the soil or irrigation water, and sodium ions leached from the soil by irrigation. It is suggested that before irrigating a piece of land the soils be assessed as to their suitability for irrigation. If applying gypsum to the soil

directly, it is best to incorporate it to the desired depth by cultivation. This insures that the gypsum actually reaches the depth to be treated. (Jamail-Arizona)
W77-04784

EFFECT OF SODIUM ON THE GROWTH OF AND ION UPTAKE BY BARLEY, SUGAR BEET AND BROAD BEANS,
Rothamsted Experimental Station, Harpenden (England).
For primary bibliographic entry see Field 3C.
W77-04787

SOIL STRUCTURAL BREAKDOWN UNDER IRRIGATION,
New South Wales Dept. of Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.
For primary bibliographic entry see Field 3F.
W77-04789

MOISTURE REGIME OF SANDY DESERT SOILS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
M. Ishankuliev.
Probl Osvo Pustyn' 5, p 36-43, 1975.

Descriptors: *Soil moisture, *Moisture content, *Sands, Deserts, Filtration, Arid climates, Infiltration.
Identifiers: *USSR(Repetek reserve lands).

The moisture of sandy desert soils, productive storage of soil moisture and depth of filtration in the Repetek reserve lands USSR, was studied in 1969-1972. During years of sufficient precipitation considerable amounts of water (35-64mm) accumulated 2 m deeper; in dry years in decreased to 0.6-5 mm.--Copyright 1976, Biological Abstracts, Inc.
W77-04795

EFFECT OF SOIL RECLAMATION ON HYDROPHYSICAL PROPERTIES OF DESERT TAKYR SOILS, (IN RUSSIAN),
M. K. Charyev, and O. G. Eshchekov.
Probl Osvo Pustyn' 5, p 29-35, 1975.

Descriptors: *Land reclamation, *Soil physical properties, Barley, Corn(Field), Cotton, Deserts, Soils, Grasses, Humidity, Soil microorganisms, Peas, Wilting, Moisture content, Humid climates.
Identifiers: *USSR(Turkmen), *Takyr soils.

Reclamaton under humid farming improves the hydrophysical proerties of takyr soils (Turkmen SSR, USSR) due to the improvement of exhange bases, enrichment with organic matter and the reproduction and intensification of soil microorganism activity. These factors intensify coagulation of dispersion particles in takyr soils and increase the number of microorganisms and water capacity, while maximum hygroscopicity and wilting humidity decrease and the fertility of the soil and the yield of agricultural crops (e.g., cotton, barley, sudan grass, peas, corn) are improved.--Copyright 1976, Biological Abstracts, Inc.
W77-04799

PERCOLATING EFFLUENT INTO GROUND REDUCES COLOR AT MISSOULA MILL,
Hoerner Waldorf Corp., Missoula, Mont.
For primary bibliographic entry see Field 5D.
W77-04824

WATER REGIME OF CENTRAL KARA KUM SOILS IN CONNECTION WITH RANGELAND AFFORESTATION, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Inst. of Deserts.
G. Mukhammedov, and B. M. Alekseev.
Probl Osvo Pustyn' 5, p 44-50, 1975.

Descriptors: Soils, *Soil moisture, *Moisture content, Ranges, Forests, *Cultivation, *Sands, Deserts, Arid lands.
Identifiers: *USSR(Central Kara Kum).

Agrotechnical measures such as plowing of small hummooky sands and sandy takyr soils, establishing moisture storing furrows (which provided for productive moisture accumulation 1.5-2 times more than that in virgin lands) facilitated the successful accomplishment of afforestation under desert conditions.--Copyright 1976, Biological Abstracts, Inc.
W77-04855

EFFECT OF THE GROUNDWATER LEVEL AND SOIL MOISTURE CONTENT ON PHOTOPHOSPHORYLATION OF BARLEY, WHEAT AND OAT CHLOROPLASTS, (IN BELORUSSIAN),
For primary bibliographic entry see Field 2I.
W77-04884

TOTAL SOIL FLUORIDE DETERMINATION BY A SINGLE DISTILLATION SELECTIVE ION ELECTRODE PROCEDURE,
Ohio Agricultural Research and Development Center, Wooster. Lab. for Environmental Studies.
J. R. McClenahen, and E. R. Schulz.
Soil Science, Vol. 122, No. 5, p 267-270, November 1976. 3 tab, 19 ref.

Descriptors: *Fluorides, *Electrodes, *Soil analysis, *Instrumentation, *Chemical analysis, Halogens, Analytical techniques, Inorganic compounds, Ions, Chemistry, Analysis, Soil tests, Distillation, Testing, Separation techniques, Equipment, Testing procedures.
Identifiers: *Selective ion electrode, *Ion electrode procedure, Fluoride analysis, Steam distillation procedure, Total soil fluoride, Mineral analyses.

A simple, precise method is presented for determining total soil fluoride. The soil sample was decomposed by a standard steam distillation in the presence of H2SO4. An aliquot of the resulting distillate was diluted 1:1 with a total ionic strength adjustment buffer (TISAB), and the fluoride determination was made by selective ion electrode (pF) procedure. This method, when compared with a double distillation-pF technique on 15 Ohio soils, yielded slightly, but significantly, higher results. The H2SO4 distillation-pF procedure is relatively quick, precise, reproducible, and eliminates the hazard associated with the HCl04 distillation step used in most other techniques. (Henley-ISWS)
W77-04885

ON THE ROLE OF SOIL MOISTURE HYSTERESIS IN THE SUPPRESSION OF EVAPORATION FROM BARE SOIL UNDER DIURNALLY CYCLIC EVAPORATIVITY,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2D.
W77-04886

INFILTRATION THROUGH SOIL WITH A SLIGHTLY PERMEABLE BURIED MEMBRANE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Soil Science.
D. Zaslavsky, and M. Garber.
Soil Science, Vol. 122, No. 6, p 321-330, December 1976. 6 fig, 1 tab, 3 ref.

Descriptors: *Infiltration, *Soil moisture, *Membranes, *Model studies, Mathematical models, Hydraulic conductivity, Evaporation, Evapotranspiration, Soils, Root zone, Permeability, Evaporation control, Agriculture, Soil science.
Identifiers: Buried membranes.

The idea of using membranes to slow down the loss of water from the root zone is presented. A number of reasons led to the conclusion that the use of slightly permeable membranes is the optimal solution to achieve this goal. The simultaneous process of filtration and evapotranspiration in a soil profile bordered on one side by a soil surface and on the other side by a permeable membrane placed parallel to it was considered. Solutions were presented in nondimensional form. Concrete examples were given of the use of these solutions in practical applications. (Sims-ISWS)
W77-04887

MICRO-RELIEF SURFACE DEPRESSION STORAGE: ANALYSIS OF MODELS TO DESCRIBE THE DEPTH-STORAGE FUNCTION,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
J. K. Mitchell, and B. A. Jones, Jr.
Water Resources Bulletin, Vol. 12, No. 6, p 1205-1222, December 1976. 3 fig, 6 tab, 7 ref.

Descriptors: *Depression, *Model studies, *Depression storage, Hydrology, Surface waters, Interception, Soil water, Soils, Rainfall-runoff relationships, Equations, Storage.
Identifiers: *Surface depression, Depth-storage function, Micro-relief depression, Darwin silty clay, Sparta loamy sand, Cisne silt loam, Flanagan silt loam.

Micro-relief surface depression storage is one of the components of the rainfall-runoff process. The quantification of surface depression storage values and a depth-storage model to describe the storage were the subjects of this study. Point measurement data were collected on 258 surfaces of 5 soils and three artificial surfaces. Five methods of computing storage, 15 depth-storage models, two depth increments, and six grid spacings were investigated. The 1-in grid computational method, 0.1-in depth increment, and 1-in grid spacings were recommended. The surface depression storage function is best described by the model S = a (D to the b power), which relates surface depression storage as a function of depth with two equation parameters. Coefficients a and b were determined by regression analysis. Equations for describing the surface depression storage model parameters were developed. (Lee-ISWS)
W77-04895

AIR COMPOSITION IN SHOAL AND LITTORAL SOILS OF THE OZERNINSK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
Z. N. Gromova.
Biol Nauki. 17(9), p 133-136, 1974.

Descriptors: *Soil analysis, Reservoirs, *Methane, *Podzolic soils, Peat, *Organic soils, Oxygen, Carbon dioxide, Gases, Human.
Identifiers: *USSR(Ozerninsk Reservoir), *Gley soils.

The air composition of shoal and littoral soils of Ozerninsk Reservoir of the Ozerna River (Russian SFSR, USSR) was studied. Methane was predominant in the submerged soils near the reservoir; its level was 33-64% in the sod-podzolic soils and 66-93% in the peat-gley soils. Methane-rich peat-gley soils contained 9-10% humus, while sod-podzolic soils contained 2.0-2.5% humus. The water O2 level was higher in the sod-podzolic soils than in the peat-gley soils. The water CO2 level was reversed. The submerged soils near the reservoir with accumulated gases do not favor plant growth.--Copyright 1975, Biological Abstracts, Inc.
W77-04906

SOLID FLOW PRODUCTS OF THE ERODED LEACH CHERNOZEMS OF THE KUZNETSK BASIN, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Central Siberian Botanical Garden.
For primary bibliographic entry see Field 2J.
W77-04915

NITROGEN AND METAL CONTAMINATION OF NATURAL WATERS FROM SEWAGE SLUDGE DISPOSAL ON LAND,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-05002

CONTENT OF FREE AMINO ACIDS IN IRRIGATED AND UNIRRIGATED TYPICAL SIEROZEM SOILS, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Dept. of Microbiology.
S. M. Kaziev, T. Kh. Khadzhiev, and K. Avezov.
Uzb Biol Zh 19(1), p 10-12, 1975.

Descriptors: *Amino acids, Irrigation, *Cotton, *Indicators, Sierozems, *Wheat, Soil analysis, Plant physiology.
Identifiers: USSR(Taskent district), USSR(Samarkand district).

Using cotton and wheat as indicator plants, the typical irrigated sierozem soil of the Tashkent district (USSR) and the typical unirrigated sierozem soils of the Samarkand district (USSR) were investigated. During the growing season 10 free amino acids were found in the irrigated sierozem under cotton and 14 in the unirrigated sierozem sown to wheat. The maximum total content of amino acids in the irrigated sierozem was in the spring before planting cotton; their content decreased noticeably in the summer and fall. In the unirrigated sierozem under wheat a high content of amino acids was noted in March and May, and in July, during heading, their content decreased considerably.--Copyright 1976, Biological Abstracts, Inc.
W77-05045

2H. Lakes

FISHERY MANAGEMENT IN A MEROMICTIC ALPINE LAKE (LAKE CADAGNO, TICINO), (IN GERMAN),
Eidgenoessisches Amt fuer Umweltschutz, Bern (Switzerland).
H. Marrer.
Schweiz Z Hydrol 37(2), p 213-219, 1975.

Descriptors: *Fish management, Lakes, Limnology, Fish population, *Rainbow trout, *Brook trout, Growth rates, Seasonal.
Identifiers: *Alpine lakes, *Meromictic lakes, *Switzerland(Lake Cadagno), Ticino.

The meromictic condition of Lake Cadagno was described for the 1st time 60 yr ago. Meanwhile the monimolimnion has shown a notable increase; this phenomenon, together with the winter lowering of the lake level, has adverse effects on the fish population. The meromixis depends on chemical processes and results from the geological particularities of the region. The bioactivity of this alpine lake, which is located at an altitude above 6200 ft, is extemely high. An annual catch of fish of more than 44 lb/ha can be expected. Regular immersions of rainbow trout and brook trout in fingerling size have been practiced for several years. Both fish species reach normally the minimal size of 8 in in their 4th yr; they differ very slightly in respect of food and growth rate.--Copyright 1976, Biological Abstracts, Inc.
W77-04627

ARGULUS IN THE LAKE OF GENEVA, (IN FRENCH),
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologie Lacustre.
P. J. Laurent.
Schweiz Z Hydrol 37(2), p 249-252, 1975.

Descriptors: *Lakes, *Fish parasites, Aquatic animals, Aquatic plants, Salmonids, Fish hatcheries.
Identifiers: *Argulus foliaceus, Burbot, Coregonine, France(Lake of Geneva).

Since 1972 a considerable increase in A. foliaceus L. was noted in the Lake of Geneva (France). During the warmer months they attack all fish species except burbot and coregonines. They also afflict salmonids in fish hatcheries supplied with lake water. The elimination methods applicable in hatcheries cannot be used in the lake. A parasite reduction could, however, be expected to follow the curtailment of nutrient input into the lake, which would check the growth of aquatic plants along the shoreline. Pumping cold lake water (9-10C) into fish ponds has proven to be an effective means of preventing parasites in pisciculture.--Copyright 1976, Biological Abstracts, Inc.
W77-04655

LIMNOLOGICAL DATA AND THEIR USE IN PRACTICAL WATER MANAGEMENT, (IN GERMAN),
Institut fuer Wasserwirtschaft, Magdeburg (East Germany).
For primary bibliographic entry see Field 5G.
W77-04657

FOOD SELECTION IN TILAPIA GALILAEA (PICES, CICHLIDAE) OF LAKE TCHAD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
L. Lauzanne, and A. Iltis.
Cah ORSTOM Ser Hydrobiol 9(3), p 193-199, 1975.

Descriptors: Fish, Tilapia, *Fish food organisms, Algae, Diatoms, Cyanophyta, Lakes, Africa, *Fish diets, Cichlids.
Identifiers: *Tilapia-Galilaea, *Lake Chad.

T. galilaea is a phytoplanktivorous fish of Lake Chad which feeds on bottom deposits composed essentially of benthic algae. Food selection of this fish was studied using a coefficient of electivity (Ivlev, 1961) with which algae were separated into 3 groups according to their susceptibility to ingestion by T galilaea. Results show that filamentous blue-green algae are more convenient for the diet of Tilapia than diatoms.--Copyright 1976, Biological Abstracts, Inc.
W77-04687

FOOD PATHWAYS IN REGULATED LAKES, (IN SWEDISH),
T. Lindstrom.
Fauna Flora (Stockh) 70(2), p 60-68, 1975.

Descriptors: *Lakes, *Food chains, *Energy budget, Regulation, Insects, Fish population.
Identifiers: *Regulated lakes.

Energy budgets within regulated lakes which have fish as the final product are described. Studies of the stomach contents of fish have given information about fish diets but are only incomplete samples of the available food materials in the lakes. The migration of river fishes between lakes and rivers are hindered when the water levels are reduced drastically or kept unusually high. Some food materials are brought in by tributary streams, others result from land insects that fall into the water. In newly regulated lakes nutrient levels are high near the shores but later they become relatively low here. Some of the fish that primarily live in open water can be harvested through the ice or by means of nets or trawls. If regulated lakes are to be utilized for maximum food production the number of links in the food chain must be reduced and the fish population must be kept young and productive. It is also possible that it will be economically feasible to use artificial feeding.--Copyright 1976, Biological Abstracts, Inc.
W77-04746

LAKE ONTARIO ATLAS: LAND USE,
New York Sea Grant Inst., Albany.
M. Dobson, and F. Henderson.
Lake Ontario Atlas No. NYSSGP-0A-76-020, 1976. 56 p, 32 fig, 1 tab, 8 ref, append.

Descriptors: *Lake Ontario, *Land use, *Shore protection, *Ecosystems, Shores, *Maps, Coasts, Information exchange, Agriculture.
Identifiers: Information systems.

The Land Use Monograph provides a flexible data base for inventory and analysis of land activity along the Lake Ontario shoreline. For this tudy the Lake Ontario shoreline was defined as the area extending six kilometers inland from the lake. This area is probably the most susceptible to the diverse pressures exerted by developers, recreationists, and expanding urbanized places seeking lake-shore properties. The data compiled in this analysis support the discussion of the history and development of the Lake Ontario shoreline found in the introductory portions of this report. By employing the LOLUIS (Lake Ontario Land Use Information System) data, changes and rates of change for each of the sub-county areas can be monitored quickly and easily and compared with desired or planned land use. This is no mean capability given the fact the lakeshore is simultaneously on of the most fragile ecosystems and one most subject to divergent land use interests and designs in the future. The final section of the report is devoted to a brief discussion of the potential uses, application, and recommendations for further analysis. (NOAA)
W77-04846

LIGHT EXTINCTION MEASUREMENTS IN THE EXPERIMENTAL LAKES AREA--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W77-04862

COMPARATIVE STUDY OF E. COLI SURVIVAL IN TWO AQUATIC ECOSYSTEMS,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
For primary bibliographic entry see Field 5C.
W77-04863

PHYTOPLANKTON PRIMARY PRODUCTION IN THE EXPERIMENTAL LAKES AREA USING AN INCUBATOR TECHNIQUE--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W77-04868

HEAT STORAGE AND ADVECTION IN LAKE ERIE,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. A. Derecki.
Water Resources Research, Vol 12, No 6, p 1144-1150, December 1976. 3 fig, 8 tab, 7 ref.

Descriptors: *Lakes, *Water temperature, *Heat transfer, *Lake Erie, Temperature, Heat,

*Advection, Circulation, Heat balance, Heat budget, Depth, Ice, Limnology.
Identifiers: *Heat storage.

Heat content and net advection based on long-term monthly mean input data covering 17 years (1952-1968) were derived for Lake Erie. The lake heat storage changes and net advection, with major components, were presented for the average monthly periods, indicating normal values for these parameters. Data limitations for the lake heat content precluded computation of monthly values by individual years. Derivation of the necessary input data (water temperature profiles, water supply and loss factors with appropriate temperatures, and ice conditions) was briefly described. (Sims-ISWS)
W77-04879

A SQUEEZER FOR EFFICIENT EXTRACTION OF PORE WATER FROM SMALL VOLUMES OF ANOXIC SEDIMENT,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2J.
W77-04892

CHEMICAL WATER SAMPLING IN LAKES AND SEDIMENTS WITH DIALYSIS BAGS,
Dartmouth Coll., Hanover N.H. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2K.
W77-04893

THE EFFECT OF SALT ON SMALL, ARTIFICIAL LAKES,
Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5A.
W77-04896

SYNOPTIC SURVEY OF HYPOLIMNETIC AERATION,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-04899

COMPARATIVE STUDY WITH COSTS OF HYPOLIMNETIC AERATION,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-04900

AIR COMPOSITION IN SHOAL AND LITTORAL SOILS OF THE OZERNINSK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W77-04906

WATER QUALITY AND BATHYMETRY OF SAND LAKE, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04970

DISTRIBUTION AND EFFECTS OF HEAVY METALS IN A CONTAMINATED LAKE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W77-05001

TOWARD SIMULATION AND SYSTEMS ANALYSIS OF NUTRIENT CYCLING IN THE OKEFENOKEE SWAMP, GEORGIA,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5B.
W77-05005

INTERIM CLASSIFICATION OF WETLANDS AND AQUATIC HABITATS OF THE UNITED STATES,
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-05049

2I. Water In Plants

EFFECT OF PERIODIC DRAINING ON CONTENT OF FREE AMINO ACIDS IN SOME AQUATIC MACROPHYTES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
T. I. Shokod'ko, L. F. Lukina, and M. V. Malinovskaya.
Gidrobiol Zh 11(6), p 72-76, 1975.

Descriptors: *Amino acids, Drainage, Aquatic plants, *Water stress, *Moisture deficit, *Grasses, Plant physiology.
Identifiers: Butomus-umbellatus, *Macrophytes, Phragmites-communis, Polygonum-amphibum, Scirpus-lacustris, *Reeds, Willow grass, *Rushes, Bulrushes.

Insufficient water due to periodic draining has different effects on different aquatic macrophytes. The most resistant to a moisture shortage were the common reed (Phragmites communis) and willow-grass (Polygonum amphibium); this is due to an insignificant decrease in total free amino acids in them. No qualitative changes in the composition of amino acids of these plants were noted. The flowering-rush (Butomus umbellatus) and bullrush (Scirpus lacustris) reacted to a moisture shortage by a marked decrease of free amino acids with a slight increase of glutamic acid and theornine, which may be related to the protective reaction of the plants against poisoning by ammonia following marked dehydration and high temperatures.--Copyright 1976, Biological Abstracts, Inc.
W77-04748

CHANGES IN FOREST STRUCTURES IN THE EMMENTAL EXPRESSED IN THE TREE COUNT AND DISTRIBUTION AND THE POSSIBLE LONG-TERM DETERIORATION OF WATER UTILIZATION, (IN GERMAN),
Swiss Forest Research Inst., Birmensdorf.
For primary bibliographic entry see Field 4A.
W77-04778

EFFECT OF SODIUM ON THE GROWTH OF AND ION UPTAKE BY BARLEY, SUGAR BEET AND BROAD BEANS,
Rothamsted Experimental Station, Harpenden (England).
For primary bibliographic entry see Field 3C.
W77-04787

EFFECT OF THE GROUNDWATER LEVEL AND SOIL MOISTURE CONTENT ON PHOTOPHOSPHORYLATION OF BARLEY, WHEAT AND OAT CHLOROPLASTS, (IN BELORUSSIAN),
L. P. Smolyak, U. H. Reutski, and Zh. I. Kazlova.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk. 3, p 29-34. 1974.

Descriptors: *Soil moisture, *Groundwater, Water level, Barley, Wheat, Oats, *Capillary action, Soil water.
Identifiers: *Chloroplasts, Phosphorylation, *Photophosphorylation.

The maximum rate of photophosphorylation of barley, wheat and oat chloroplasts is observed on plots where the upper boundary of the transition zone of the capillary moisture lies at the soil surface. This indicates that a groundwater level corresponding to such a position of the upper boundary of the capillary fringe is optimal.--Copyright 1975, Biological Abstracts, Inc.
W77-04884

THE EFFECT OF NACl ON THE CONCENTRATION OF PROLINE IN DIFFERENT HALOPHYTES, (IN GERMAN),
Technische Hochschule, Darmstadt (West Germany); and Technische Hochschule, Darmstadt (West Germany). Botanisches Institut.
S. Treichel.
Z Pflanzenphysiol 76(1), p 56-68, 1975.

Descriptors: Salts, *Sodium chloride, *Halophytes, *Osmotic pressure, Plant physiology, Ions.
Identifiers: Aster-tripolium, Mesembryanthemum-nodiflorum, *Proline, Salicornia-fruticosa.

The halophytes Salicornia fruticosa, Aster tripolium and Mesembryanthemum nodiflorum were used to measure the ability of plants to synthesize proline during osmotic stresses. All investigated plants or plant organs responded to a rise of osmotic potential in the culture solution by increasing the concentration of nonprotein proline. The amount of accumulation of free proline depended on the degree of increase in the osmotic stress. There were substantial differences in proline accumulation in the 3 spp. or in plant organs of different age. Young leaves and seedlings of A. tripolium exhibited the highest amounts of proline under the same conditions as fully developed leaves of the same plants. The increase of free proline concentration is strongly related to the concentration of Na+ + Cl- in the sap of the plants. After a certain period depending on the species and age the ratio of microgram mol proline/meq(Na+ + Cl-) became constant. Proline might be involved in the process of osmotic adjustment. The discrepancy in concentration of proline and that of ions in the sap is discussed with respect to compartmentalization of prolin.--Copyright 1976, Biological Abstracts, Inc.
W77-04912

DROUGHT EFFECT ON THE OPTICAL PROPERTIES OF WINTER WHEAT LEAVES, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
K. S. Tkachuk, and I. L. Aerov.
Do Pov Akad Nauk Ukr Rsr Ser B Heol Heofiz Khim Biol 36(12), p 1122-1125, 1974.

Descriptors: *Leaves, *Wheat, Droughts, Absorption, Chlorophyll, *Optical properties, Plant physiology, *Drought tolerance.
Identifiers: *Winter wheat.

The differences were observed in changes of optical properties of winter wheat leaves caused by constant and sudden soil drought. While cultivating winter wheat under conditions of constant soil drough (40% of total moisture-holding capacity) radiant energy absorption by leaves was slightly increased. Under the effect of sudden soil drought at 12% decrease was observed in the radiant energy absorption. The changes in potimal properties are considered in connection with the chlorophyll content in leaves.--Copyright 1976, Biological Abstracts, Inc.
W77-04916

MACROPHYTES OF LIMNETIC HABITATS AND THEIR REACTION UPON P-TOLUENE SULFONIC ACID IN THE SUBSTRATE: I. ON THE TOLERANCE OF MARSH AND WATER PLANTS OF P-TOLUENE SULFONIC ACID, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 5C.

W77-05099

MACROPHYTES OF LIMNETIC HABITATS AND THEIR REACTION UPON P-TOLUENE SULFONIC ACID IN THE SUBSTRATE: II. ELIMINATION OF P-TOLUENE SULFONIC ACID IN MODEL SYSTEMS WITH MARSH AND WATER PLANTS, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 5C.
W77-05100

2J. Erosion and Sedimentation

TABLES OF GEOMETRY FOR LOW-STANDARD ROADS FOR WATERSHED MANAGEMENT CONSIDERATIONS, SLOPE STAKING, AND END AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-04831

SUSPENDED SEDIMENT DATA FROM NEARSHORE WATERS OF GEORGIA,
Georgia Univ., Savannah. Marine Extension Center.
R. Brokaw, and G. F. Oertel.
Technical Report Series No. 76-3, (1976). 43 p, 8 fig, 12 ref, append. SG-10-32-RR273-077.

Descriptors: *Turbidity, *Estuaries, Georgia, Water sampling, Coasts, Sampling, Tidal waters, *Suspended load, Remote sensing, *Sediment transport, Sediments.
Identifiers: *Georgia Bight, *Suspended sediments, Nearshore waters, Satellite photography.

The nearshore water of the Georgia Bight is very turbid relative to other areas of the east coast (Manheim, Meade and Bond, 1970, Oertel, 1976). The turbidity of the waters is documented through a variety of different oceanographic projects, some of which were oriented toward biologic, physical, chemical or geologic investigations. Because of this variety some of the data are not always comparable. This technical report is a summary of recent suspended sediment data collected from nearshore waters of Georgia. No attempt is made to interpret the mechanics of suspended sediment transport or the processes controlling its distribution. Data that was collected from various sources are presented in atlas form. The study area extended from Cape Romain, South Carolina to Jacksonville, Florida. Data recovery within this area was restricted to projects that were predominately located within the nearshore zone (0-40 km offshore). Several samples that were not included were part of estuarine sampling programs or shelf and gulf water sampling programs. A more complete description of these data may be found in the literature of the bibliography (NOAA)
W77-04836

JOHN'S PASS AND BLIND PASS GLOSSARY OF INLETS REPORT NO. 4,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-04841

A SQUEEZER FOR EFFICIENT EXTRACTION OF PORE WATER FROM SMALL VOLUMES OF ANOXIC SEDIMENT,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
J. A. Robbins, and J. Gustinis.
Limnology and Oceanography, Vol. 21, No. 6, p 905-909, November 1976. 1 fig, 15 ref. EPA R-803086.

Descriptors: *Water sampling, *Membranes, *Lake sediments, *Great Lakes, *Separation techniques, *Chemical analysis, Sampling, Physical properties, Instrumentation, Water analysis, Sediments, Analytical techniques, Filters, Filtration, Lakes.
Identifiers: *Squeezer, *Anoxic sediment, *Membrane filter, *Pore water extraction, *Sediment squeezer, Extraction, Sediment pore water, Chemical quality, Chemical composition, Analytical method, Sediment sampler, Anoxic sediment cores, Analytical procedure, Pistonless sediment squeezer.

Development is reported of a simple, small-volume, low pressure, diaphragm-type sediment squeezer made from inexpensive standard nylon stock material, suitable for trace metal studies, which features a removable sediment cassette with a prefilter, which greatly facilitates loading and cleaning. Pore water is recovered rapidly through a large, active area membrane filter without clogging, impermeable cake formation, or gas break-through. A minimal pore water dead volume significantly reduces flushing losses and facilitates online electrode measurements. The Squeezer was designed to accept small quantities of unconsolidated sediment (20-100 ml) from refrigerated cores sectioned in a nitrogen-filled glove box. (Henley-ISWS)
W77-04892

CHEMICAL WATER SAMPLING IN LAKES AND SEDIMENTS WITH DIALYSIS BAGS,
Dartmouth Coll., Hanover N.H. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2K.
W77-04893

AN IN SITU SAMPLER FOR CLOSE INTERVAL PORE WATER STUDIES,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2K.
W77-04894

SOLID FLOW PRODUCTS OF THE ERODED LEACH CHERNOZEMS OF THE KUZNETSK BASIN, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Central Siberian Botanical Garden.
A. A. Tanasienko.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk. 2, p 3-7, 1974.

Descriptors: *Nitrogen, *Potassium, *Humus, Acids, Cultivation, Soil aggregates, Calcium, Oxides, Nutrients, *Soil erosion, *Chernozems, Leaching.
Identifiers: *USSR(Kuznetsh Basin).

About 60 kg N, 30 kg P and 1000 kg/ha humus are annually lost from the slope lands. From the plowed layer the most valuable aggregates containing high amount of humic acids, total Ca, sesquioxides and nutrients are washed out. The rest of the humus horizon of the roded soils is therefore characterized by low fertility.--Copyright 1975, Biological Abstracts, Inc.
W77-04915

SOME ASPECTS OF BOTTOM SEDIMENT TRANSPORT MECHANICS ON THE CONTINENTAL SHELF,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2L.
W77-04946

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENTS,
State Univ., of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.

W77-04948

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 2. WATER QUALITY RECORDS.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W77-04976

SEDIMENT-CONTROL METHODS IN URBAN DEVELOPMENT: SOME EXAMPLES AND IMPLICATIONS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-04982

RELATION OF EROSION TO SEDIMENT YIELD,
Geological Survey, Lakewood, Colo. Water Resources Div.
R. F. Hadley, and L. M. Shown.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 1-132 - 1-139, 1976. 3 fig, 1 tab, 4 ref.

Descriptors: *Erosion, *Sediment yield, *Correlation analysis, Methodology, River basins, Geology, Topography, Dams, Channel morphology, Sediment transport, Sampling, *Colorado.
Identifiers: *Ryan Gulch basin(Colo).

Sediment yield is dependent on the gross erosion in the drainage basin and the transport efficiency of the channel network. Stream-channel characteristics, diversity in landforms, and flood-plain development all are important factors in determining conveyance, or sediment delivery to downstream points. Qualitative evaluation was made of sediment conveyance, on a scale of zero to one for Ryan Gulch basin, northwestern Colorado. The presence of alluvial fans, dams and irrigation works, headcuts and ungillied reaches of valley floor and general channel condition were considered. An average conveyance for the basin was computed by weighting ratings of individual reaches. The estimated conveyance for the whole basin indicated that only a very small part of the eroded material is presently being transported through the system. (Woodard-USGS)
W77-04986

INSTRUMENTATION: AUTOMATIC COLLECTION OF SEDIMENT DATA,
Geological Survey, St. Paul, Minn. Water Resources Div.
J. V. Skinner, and J. P. Beverage.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 7-1 - 7-16, 1976. 1 fig, 17 ref.

Descriptors: *Suspended solids, *Sediments, *Suspended load, *Measurement, *Analytical techniques, Sampling, Methodology, Automation, Data collections, *Instrumentation.

Federal Inter-Agency Sedimentation Project has included research of methods of automating the collection of suspended-sediment data. Several approaches have been investigated ranging from automatic sample collection to automatic sample analysis. To automate sample collection, several forms of pumping samplers have been developed. To automate sample analysis both direct and indirect methods have been studied. Analysis by indirect methods have included the influence of suspended sediment on conduction of electric currents and on radiation from acoustic, visible light, and gamma sources. Analysis by direct methods have included different techniques for measuring

the bulk density of water-sediment-mixtures. Advantages and disadvantages of each approach are summarized, and suggestions for future research and development are offered. (Woodard-USGS)
W77-04987

DETERMINING SUSPENDED SEDIMENT LOADS FROM TURBIDITY RECORDS,
Geological Survey, Harrisburg, Pa. Water Resources Div.
J. F. Truhlar.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 7-65 - 7-74, 1976. 3 fig, 3 ref.

Descriptors: *Sediment discharge, *Suspended load, *Analytical techniques, *Turbidity, Construction, Highways, Erosion, Sediment control, Data collections, Streamflow, Flow rates, *Pennsylvania.

The Pennsylvania Department of Transportation and the U.S. Geological Survey are cooperating in several field studies to evaluate sediment-control measures used during highway construction. Among the parameters being monitored are suspended-sediment concentration and turbidity. The field data reveal a good correlation between daily mean discharge-weighted turbidity and daily mean discharge-weighted suspended-sediment concentration. Turbidity is monitored and recorded continuously, and the daily mean discharge-weighted turbidity is calculated from the turbidity and water-discharge data. During periods when there are insufficient suspended-sediment data, the daily mean discharge-weighted suspended-sediment concentration is determined from the turbidity-sediment correlation and used with the daily mean water discharge to calculate a daily sediment load. This method of determining sediment loads from the turbidity record suggest a possibility for computer computation of sediment loads. (Woodard-USGS)
W77-04988

SEDIMENT PROBLEMS AND PLANNING IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
W. M. Brown, III.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 1-149 - 1-162, 1976. 2 fig, 1 tab, 11 ref.

Descriptors: *Sediments, *Erosion, *Deposition(Sediments), *California, *Land use, Aerial photography, Mapping, Planning, Erosion control.
Identifiers: *San Francisco Bay region(Calif).

A procedure has been developed to define the relations among terrain properties, human activities, and erosional and depositional processes and problems. The procedure involves four basic steps: (1) Identifying the critical physical elements that control erosion of the land, the transport of eroded materials, and the deposition of transported material; (2) analyzing the land surface using high-resolution aerial imagery; (3) mapping the erosional and depositional features and provinces; and (4) developing a planning matrix that relates land use to human activity. The procedure has been applied in the San Francisco Bay region, California, and the Willamette River basin, Oregon. The San Francisco Bay region, vastly altered by human activities during a 200-year period, experiences serious and pervasive sediment-related problems. (Woodard-USGS)
W77-04989

BEDLOAD TRANSPORT IN TWO LARGE, GRAVEL-BED RIVERS, IDAHO AND WASHINGTON,
Geological Survey, Lakewood, Colo. Water Resources Div.
W. W. Emmett.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 4-101 - 4-114, 1976. 4 fig, 4 tab, 10 ref.

Descriptors: *Sediment transport, *Particle size, *Bed load, *Gravels, *Streamflow, Flow rates, *Idaho, Sampling, Bed load samples, *Washington.
Identifiers: *Snake River(Idaho), *Clearwater River(Idaho), *Lewiston area(Idaho).

Bedload transport in two gravel-bed rivers has been measured by direct sampling in the Snake and Clearwater Rivers in the vicinity of Lewiston, Idaho. These rivers are large and capable of high flows producing mean depths in excess of 6 meters (20 ft) and velocities in excess of 3 meters per second (10 ft/s). At high values of streamflow when the rivers are competent to move almost all sizes of particles on the streambed, bedload-transport rates are correlative with a predictable proportion of stream-power expenditure. As streamflow decreases and the river loses competence to transport the coarser bed particles, the channel bottom becomes armored and limits the availability of smaller sized material. As the channel becomes armored, the smaller material is transported at efficiencies that are greatly reduced from those predicted. Both rivers have a deficiency in bed material of intermediate sizes. Thus, median particle size of bedload shifts abruptly from very coarse gravel when all sizes of material are moving, to coarse sand when the channel bottom becomes armored. (Woodard-USGS)
W77-04990

PREDICTION OF SEDIMENT YIELDS IN WISCONSIN STREAMS,
Geological Survey, Madison, Wis. Water Resources Div.
S. M. Hindall.
In: Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 1-205 - 1-218, 1976. 5 fig, 2 tab, 7 ref, append.

Descriptors: *Sediment transport, *Sediment yield, *Wisconsin, *Streams, *Forecasting, Equations, Regression analysis, Streamflow, Topography, Soils, Land use, Vegetation.
Identifiers: *Sediment yield forecasting.

A method has been developed to predict sediment yields at any point on 95 percent of Wisconsin streams. The procedure is simple and requires only data that are readily available. It consists of equations that relate sediment yield to the geographic or physical factors that control sediment production and transport. The equations were developed through regression techniques using physical factors such as topography, soils, land use and cover, stream hydraulics, and climate as independent variables and sediment yield as the dependent variable. The equations are only valid for areas in which the geography is similar to that of Wisconsin, but the procedure used to develop the predictive equations may be applicable in any area where there is sufficient sediment-yield data. (Woodard-USGS)
W77-04991

2K. Chemical Processes

HYDROMINERAL DEPOSITS AT VOLVIC, (IN FRENCH),
A. Aubignat.
Rev Sci Nat Auvergne 39(1-4), p 39-72, 1973.

Descriptors: *Mineralogy, Hydrogeology, Water analysis, *Bacteriology, Basins, Stratigraphy, Reviews, Underground streams, Groundwater.
Identifiers: *France(Volvic-Saint-Genes).

A study of the hydrogeologic basin at Volvic-Saint-Genes (S. France) and a review of the research leading to the use of its underground streams as a source of commercial mineral water are presented. Physical, chemical bactériological analyses of the water were made, and the various stratigraphic layers are described.--Copyright 1976, Biological Abstracts, Inc.
W77-04656

WASTEWATERS IN THE VADOSE ZONE OF ARID REGIONS: GEOCHEMICAL INTERACTIONS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
D. D. Runnells.
Ground Water, Vol. 14, No. 6, p 374-385, November-December 1976. 3 fig, 3 tab, 33 ref.

Descriptors: *Waste water disposal, *Arid lands, *Vadose water, *New Mexico, Geochemistry, Chemical reactions, Leachate, Waste water treatment, Waste dilution, Hydrogen ion concentration, Chemical precipitation, Hydrolysis, Oxidation, Reduction(Chemical), Filtration, Membrane processes, Sorption.
Identifiers: Buffering, Volatilization, Biological assimilation, Radioactive decay.

Because of increasingly stringent laws governing discharge of fluid wastes to surface waters, the alternative of discharge to the subsurface has become attractive. The physical-chemical processes that prevail in the subsurface are not well understood, but they are clearly not identical to processes of purification in surface waters. Eleven physical-chemical processes can be identified as having potential value for purifying wastes discharged to the subsurface, as follows: dilution, buffering of pH, precipitation by reaction, hydrolysis oxidation or reduction, filtration, volatilization, biological assimilation, radioactive decay, membrane filtration, and sorption. Discharge to the vadose zone may be a safe means of disposal of wastes in arid regions. But it is necessary to carefully test the suitability of a particular site for a particular waste. Regulations governing subsurface discharge should take into account the physical-chemical processes that may act to purify the waste fluids. In one set of experiments, a soil from Sulfur Springs, New Mexico, was capable of removing large quantities of dissolved molybdenum and copper from a synthetic mill water, and the soil was able to quantitatively retain the copper during subsequent leaching by fresh and metal-free mill waters. (See also W77-04754) (Visocky-ISWS)
W77-04755

PREDICTING SPECIFIC CONDUCTANCE AND SALT CONCENTRATION IN DILUTE AQUEOUS SOLUTIONS,
California Univ., Berkeley.
For primary bibliographic entry see Field 2G.
W77-04765

PARTIAL MOLAL VOLUMES OF SOME MAJOR IONS IN SEAWATER,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
A. Poisson, and J. Chanu.
Limnology and Oceanography, Vol. 21, No. 6, p 853-861, November 1976. 2 fig, 8 tab, 18 ref.

Descriptors: *Physicochemical properties, *Sea water, *Water chemistry, *Water properties, *Saline water systems, Physical properties, Conductivity, Density, Properties, Chemistry, Chemical properties, Salinity, Ions, Temperature, Water temperature, Mathematical studies, Thermodynamics.

Identifiers: *Partial molal volumes, *Sea water major ions, *Molal volumes, *Thermal expansibilities, Densimetric method, Partial molal conductivities.

A densimetric method was used for determining the partial molal volumes of NaCl, KCl, CaC12, MgC12, Na2SO4, and MgSO4 in seawater, and thermal expansibilities of the partial molal volumes of these salts were deduced. A semi-empirical relation was proposed for the partial molal volumes of salts in the range of temperatures and salinities of the world ocean. The partial molal volumes of these ions were estimated on the assumption that the partial molal volume at infinite dilution of proton is exact, and that the volume of transfer of Cl(-) from pure water to seawater does not vary with temperature. A convenient equation of partial molal volume of ions as a function of temperature and salinity was given. (Henley-ISWS)
W77-04766

THE ANALYSIS OF SULFATE ION IN SEAWATER BY DIFFERENCE CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
F. L. Sayles, and P. C. Mangelsdorf, Jr.
Limnology and Oceanography, Vol. 21, No. 6, p 899-905, November 1976. 5 fig, 1 tab, 14 ref. NSF DES 03002, ERDA AT (11-1)-3119.

Descriptors: *Sulfates, *Sulfur compounds, *Chromatography, *Sea water, *Chemical analysis, Sulfur, Analytical techniques, Sulfur bacteria, Analysis, Evaluation, Water analysis, Chemistry, Salinity, Instrumentation, Chlorides.
Identifiers: *Difference chromatography, *Analytical methods, Marine sediments, Analytical procedures, Ion exchange chromatography, Sea water analysis.

A metod of analysis of SO4(--) in sea water or seawaterlike sample was based on difference chromatography techniques and achieved a precision of better than 0.1% in the determination of SO4(--): Cl(-) ratios. The determination was made on only 0.5 ml of sea water, making the technique particularly suitable for interstitial water studies where limited volumes of sample are available. (Henley-ISWS)
W77-04767

DETERMINATION OF TRACE VANADIUM IN NATURAL WATERS BY A COMBINED ION EXCHANGE-CATALYTIC PHOTOMETRIC METHOD,
Yamanashi Univ., Kofu (Japan). Dept. of Applied Chemistry.
For primary bibliographic entry see Field 5A.
W77-04796

EXTRACTION-PHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF NITRITE IN WATERS,
Okayama Univ. (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-04797

OPTIMIZATION OF A SIMPLE SPOTTING PROCEDURE FOR X-RAY FLUORESCENCE ANALYSIS OF WATERS,
Antwerp Univ., Wilrijk (Belgium). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-04798

MINERAL SPRINGS OF ICELAND, THEIR CHARACTER AND CURATIVE PROPERTIES, (IN GERMAN),
Laboratorium fuer Wasseruntersuchungen, Hanlen (West Germany).
K. Hoell.
Res Inst Nedri As Hveragerdi Icel Rep 19, p 1-50, 1974.

Descriptors: *Springs, *Mineral water, *Water analysis, Calcium, Chlorides, Public health.
Identifiers: *Iceland(Snaefellsness).

Springs (15) were investigated, most of them on Snaefellsnes in W Iceland. Water analyses show that most of them are poor in Ca and unsuitable for use as drinking cures. They are low in chlorides. Some of them might be developed into spas.--Copyright 1976, Biological Abstracts, Inc.
W77-04842

THE SORPTION OF IODATE AND IODIDE BY RIVERINE SEDIMENTS: ITS IMPLICATIONS TO DILUTION GAUGING AND HYDROCHEMISTRY OF IODINE,
Institute of Hydrology, Wallingford (England).
C. Neal, and V. W. Truesdale.
Journal of Hydrology, Vol 31, No 3/4, p 281-291, December 1976. 5 tab, 17 ref.

Descriptors: *Iodine, *Sorption, *Sediments, Tracers, Chemicals, Chemical analysis, Freshwater, Sea water, Rivers, Estuaries, Peat, Salinity, Laboratory tests, Suspended solids, *Iodides, Water chemistry.
Identifiers: *Iodates.

A study of the sorption of iodate and iodide from solution (40 micrograms/liter -I) onto fourteen natural river sediments, peat, and twelve sediment components showed that in rivers where the suspended sediment load is than 0.1 g/1, significant sorption (greater than 0.5 microgram/liter) of iodide is unlikely to occur. With iodate there is a greater chance of sorption, particularly on iron hydroxide. The results suggested, therefore, that iodide should be a reliable tracer during measurement of river flow rates by the dilution technique. Nevertheless, two simple tests which establish whether sorption occurs were described. Experiments conducted at different ionic strengths (NaCl solution and sea water) suggested that sorptive processes will exert some control over the distribution of iodate and iodide in some estuaries. A mechanism by which the freshwater could be enriched with iodate and iodide from sea water was proposed. The sorptive behavior of iodate and iodide on peat conflicts with Kharkar, Turekian, and Bertine's contention that where a trace element is adsorbed from freshwater, it is always released to a greater or lesser extent on contact with sea water because of displacement by other ions. This paradox was resolved. (Sims-ISWS)
W77-04874

ON THE PRECISION OF SALT DILUTION GAUGING,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2E.
W77-04875

TOTAL SOIL FLUORIDE DETERMINATION BY A SINGLE DISTILLATION SELECTIVE ION ELECTRODE PROCEDURE,
Ohio Agricultural Research and Development Center, Wooster. Lab. for Environmental Studies.
For primary bibliographic entry see Field 2G.
W77-04885

CHEMICAL WATER SAMPLING IN LAKES AND SEDIMENTS WITH DIALYSIS BAGS,
Dartmouth Coll., Hanover N.H. Dept. of Earth Sciences.
L. M. Mayer.
Limnology and Oceanography, Vol. 21, No. 6, p 909-912, November 1976. 2 fig, 9 ref. NSF-RANN AEN72-03469 A03.

Descriptors: *Dialysis, *Water sampling, *Chemical analysis, *Separation techniques, *Membranes, Diffusion, Osmosis, Physical properties, Sampling, Instrumentation, On-site tests, Water analysis, Lakes, Lake sediments, Limnology, Sediments, Analytical techniques, Water treatment, Suspended solids, Connate water.
Identifiers: *Dialysis bags, *Dialysis sampler, Chemical quality, Chemical composition, Equilibration, Analytical method, Particulate matter, Analytical procedure.

An inexpensive, interstitial water sampler, using dialysis bags for the in situ separation of water from particulate matter in lake water and sediments was described. An example of dissolved silica was given. (Henley-ISWS)
W77-04893

AN IN SITU SAMPLER FOR CLOSE INTERVAL PORE WATER STUDIES,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
R. H. Hesslein.
Limnology and Oceanography, Vol. 21, No. 6, p 912-914, November 1976. 4 fig, 2 ref. DES 75-15105(NSF).

Descriptors: *Sampling, *Dialysis, *Pore water, *Sediments, *Water sampling, Chemical analysis, Instrumentation, On-site tests, Water analysis, Membranes, Osmosis, Separation techniques, Water quality, Diffusion, Interstices, Membrane processes, Testing procedures, Hudson River, *Phosphates, Methane, Estuaries.
Identifiers: *Hudson Estuary, Dissolved species, *Methane determinations, *Phosphate determinations, Particulate matter, Mineral quality.

A sampler for defining compositional changes over distances on the order of 1 cm in aqueous systems operates by equilibration of water contained by a dialysis membrane with the surrounding water. Depth profiles of methane and phosphate in Hudson Estuary sediments were presented as examples. (Henley-ISWS)
W77-04894

THE EFFECT OF SALT ON SMALL, ARTIFICIAL LAKES,
Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5A.
W77-04896

MAPS SHOWING GROUND-WATER CONDITIONS IN THE CONCHO, ST. JOHNS, AND WHITE MOUNTAINS AREAS, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04971

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 2. WATER QUALITY RECORDS.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W77-04976

GRAPHIC AND ANALYTICAL METHODS FOR ASSESSMENT OF STREAM-WATER QUALITY--MISSISSIPPI RIVER IN THE MINNEAPOLIS-ST PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-04984

EQUILIBRIUM STATISTICAL MECHANICAL CALCULATION OF THE MOLECULAR DIFFU-

SION COEFFICIENT FOR ISOTOPIC IMPURITIES IN LIQUID WATER,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 1B.
W77-04999

SOME BIOCHEMICAL CHARACTERISTICS OF THE WATER IN THE CARIACO TRENCH, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-05021

CONTENT OF FREE AMINO ACIDS IN IRRIGATED AND UNIRRIGATED TYPICAL SIEROZEM SOILS, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W77-05045

2L. Estuaries

REARING EXPERIMENT OF COMMON CARP IN BRACKISH WATER, (IN KOREAN),
Pusan National Univ. (Republic of Korea).
I. B. Kim, J. Y. Jo, and J. Y. Choi.
Bull Korean Fish Soc 8(3), p 181-184, 1975.

Descriptors: *Carp, *Brackish water, *Growth rates, *Salinity, *Fish diets, Tubificids, *Salt tolerance, Fish food organisms, Fish reproduction.

A series of experiments on the tolerance and growth of common carp, about 10 cm body length, in brackish water of 2-20% salinity was carried out in indoor aquariums. All fish survived in 12% salinity when transferred directly from fresh water, and at 15% when first acclimated at lower salinities. The temperature during the experiments ranged from 14-27C. The food efficiency and growth rate were good both for living Tubifex and pelletized dry feed at salinities from 2-8%, but at 12% the result was very poor for Tubifex, while for pellet feed efficiency was very good though the growth rate was relatively low.--Copyright 1976, Biological Abstracts, Inc.
W77-04661

THE CONTRIBUTION OF FERTILIZER TO THE GROUND WATER OF LONG ISLAND,
Suffolk County Dept. of Environmental Control, Hauppauge, N. Y. Fresh Water Resources Section.
For primary bibliographic entry see Field 5B.
W77-04758

PARTIAL MOLAL VOLUMES OF SOME MAJOR IONS IN SEAWATER,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
For primary bibliographic entry see Field 2K.
W77-04766

THE ANALYSIS OF SULFATE ION IN SEAWATER BY DIFFERENCE CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W77-04767

FRACTIONATION BY MOLECULAR WEIGHT OF ORGANIC SUBSTANCES IN GEORGIA COASTAL WATER,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5A.
W77-04809

POTENTIAL EFFECTS OF OIL PRODUCTION ON GEORGES BANK COMMUNITIES: A REVIEW OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR OUTER CONTINENTAL SHELF OIL AND GAS LEASE SALE NO. 42,
Woods Hole Oceanographic Institution, Mass. Seminar in Biological Oceanography.
For primary bibliographic entry see Field 6G.
W77-04834

OCEANOGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT: DATA REPORT FOR R.V. EASTWARD CRUISES E-3-74 (24-30 APRIL 1974) AND E-12-74 (23-31 JULY 1974),
Georgia Univ., Savannah. Marine Extension Center.
L. P. Atkinson.
Technical Report Series No. 76-1, (1976). 131 p, 1 fig, 2 tab, 2 append. SG-04-6-158-44017, NSF-GX-33615, G-39141.

Descriptors: Georgia, *Meteorological data, *Data collections, Aquatic life, Hydrography, Biological communities, *Organic matter, Water pollution sources, Chlorophyll.
Identifiers: *Georgia Bight, International Decade of Ocean Exploration(IDOE).

Data from Cruise E-3-74 (24-30 April 1974) and Cruise E-12-74 (23-31 July 1974) of the R/V EASTWARD in the Georgia Bight are presented. Included are the NODC station printouts with the following data: depth, temperature, salinity, oxygen, phosphate, nitrate, silicate, dissolved organic carbon, weather, ship's position, station time and depth. Biological data include: chlorophyll, carbon-14 primary productivity, particulate carbon and nitrogen, principal zooplankton species and main benthic macroinvertebrates. Sediment size analysis and mercury analysis are also included. (NOAA)
W77-04835

HYDROGRAPHY OF ONSLOW BAY, NORTH CAROLINA: SEPTEMBER 1975 (OBIS II),
Georgia Univ., Savannah. Marine Extension Center.
L. P. Atkinson, J. J. Singer, W. M. Dunstan, and L. J. Pietrafosa.
Technical Report Series No. 76-2, (1976). 154 p, 36 fig, 1 tab, 6 ref, 2 append. SG-04-6-158-44017.

Descriptors: *Bays, *Estuaries, *Hydrography, *Meteorological data, Baseline studies, Hydrologic data, *Data collections, Nutrients, Water pollution sources, Salinity, Temperature, Chlorophyll, *North Carolina.
Identifiers: *Onslow Bay(NC), Hydrographic data, Intrusion.

Data and a preliminary analysis of data obtained from cruise two (OBIS II) of the Onslow Bay Intrusion Study are presented. Data were collected from the R/V EASTWARD on 3-14 September 1975. Over the course of OBIS II, two intrusion cores were observed. One was apparently trapped nearshore over much of the study period, but as time went on, it either dissipated, moved too far shoreward or moved too far laterally along the shelf to be detected by the existing observational grid. The other (later) intrusion was first detected on 5-7 September and was observed to be moving into the Bay from the southeast over the remainder of the study period. The intruded waters were not of low enough temperature to carry high nutrient concentrations onto the shelf for study. However, the general results of this study tend to confirm the view that the basic grid array and methods are compatible with measurement of the processes that were intitally set out to study. Analyses of these data relative to the current meter data will allow a nearly complete description of the Onslow Bay system during the observational period. (NOAA)
W77-04837

DOCUMENTATION OF FOUR OCEAN-RELATED COMPUTER MODULES,
Massachusetts Inst. of Technology, Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W77-04838

ONSLOW BAY INTRUSION STUDY: HYDROGRAPHIC OBSERVATIONS DURING CURRENT METER SERVICING CRUISES IN AUGUST, OCTOBER, AND DECEMBER 1975 OBIS I, III AND IV,
Georgia Univ., Savannah. Marine Extension Center.
L. P. Atkinson, J. J. Singer, and L. J. Pietrafesa.
Technical Report Series No. 76-4, June 1976. 63 p, 19 fig, 1 tab, 4 ref, 2 append.

Descriptors: *Bays, *Estuaries, Hydrography, Cruises, *Data collections, Path of pollutants, *North Carolina, Chlorophyll, Nitrates, Phosphates, Salinity, Vertical distribution.
Identifiers: *Onslow Bay(NC), *Intrusion, Tables(Data), Cruise reports.

A preliminary analysis of chemical/physical data obtained during three current meter servicing cruises in Onslow Bay in August, October and December 1975 (OBIS I, III, IV) aboard the R/V ADVANCE II is presented. The objective of these cruises was to collect temperature and chemical data to correlate with the data recorded by current meters and thermographs which had already been deployed or which were about to be deployed at two locations in the study area. No attempt was made at this time to correlate the data to these related records. (NOAA)
W77-04839

JOHN'S PASS AND BLIND PASS GLOSSARY OF INLETS REPORT NO. 4,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mehta, C. P. Jones, and W. D. Adams.
Florida State University System Sea Grant Program Report No. 18, December 1976. 71 p, 6 fig, 7 tab, 50 ref.

Descriptors: *Inlets(Waterways), *Geomorphology, *Hydraulics, *Sedimentation, *Florida, *Baseline studies, *Resources development, Coasts, Water resources, Gulf of Mexico.
Identifiers: *Glossaries.

The numerous inlets connecting Florida's inner waters to the Atlantic Ocean and the Gulf of Mexico are important from considerations of recreational and commercial vessel traffic and also because they provide small boats access to safe refuge during unexpected servere weather and waves. This report of John's Pass and Blind Pass is one of a 'Glossary of Inlets' series to be prepared under the State University System Sea Grant project', 'Nearshore Circulation, Littoral Drift and the Sand Budget of Florida.' The purpose of this series is to provide for each inlet a summary of the more significant available information and to list known documentation. The proper management, use and control of Florida's inlets will require an appreciation of the evolution and the past response of the inlets. (NOAA)
W77-04841

PETROLEUM, TEMPERATURE, AND TOXICANTS: EXAMPLES OF SUSPECTED RESPONSES BY PLANKTON AND BENTHOS ON THE CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04844

THE MANAGEMENT OF URBAN COASTAL RESOURCES,
New York Sea Grant Inst., Albany.

For primary bibliographic entry see Field 6B.
W77-04845

WASTE DISPOSAL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5E.
W77-04847

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART 12: BIOENHANCEMENT STUDIES OF THE RECEIVING WATERS IN OUTER LOS ANGELES HARBOR,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W77-04849

THE BIOLOGICAL IMPORTANCE OF A POLLUTED ESTUARY,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W77-04860

SOLUBILITY OF OXYGEN IN WATER, SATURATION VALUES FOR FRESH WATER AND MIXTURES OF FRESH AND SEA WATER,
Nipak, Inc., Pryor, Okla.
For primary bibliographic entry see Field 5B.
W77-04864

COMPARISON OF AEROBIC AND ANAEROBIC METHYLATION OF MERCURIC CHLORIDE BY SAN FRANCISCO BAY SEDIMENTS,
California Univ., Berkeley. Div. of Environmental Health Sciences.
For primary bibliographic entry see Field 5C.
W77-04867

OPTIMAL PUMPING REGIMES IN AN UNCONFINED COASTAL AQUIFER,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W77-04873

THE SORPTION OF IODATE AND IODIDE BY RIVERINE SEDIMENTS: ITS IMPLICATIONS TO DILUTION GAUGING AND HYDROCHEMISTRY OF IODINE,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2K.
W77-04874

A SINGLE-POTENTIAL SOLUTION FOR REGIONAL INTERFACE PROBLEMS IN COASTAL AQUIFERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 2F.
W77-04881

INJECTION/EXTRACTION WELL SYSTEM--A UNIQUE SEAWATER BARRIER,
Brown and Caldwell, Pasadena, Calif.
For primary bibliographic entry see Field 4B.
W77-04888

AN IN SITU SAMPLER FOR CLOSE INTERVAL PORE WATER STUDIES,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2K.
W77-04894

SOME REMARKS ON COMPUTER MODELING OF COASTAL FLOWS,
California Univ., Berkeley. Dept of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04897

MODEL OF HURRICANE TIDE IN CAPE FEAR ESTUARY,
National Meteorological Center, Washington, D.C.
J. E. Overland, and V. A. Myers.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW4, Proceedings Paper 12549, p 407-424, November 1976. 14 fig, 2 tab, 13 ref, 2 append.

Descriptors: *Estuaries, *Hurricanes, *Storm surge, *Numerical analysis, *North Carolina, *Statistical methods, Hydraulic models, Climatology, Tides, Calibrations, Water levels, Dredging, Computer programs, Model studies, Mathematical models, Forecasting.
Identifiers: *Cape Fear estuary(NC), Astronomical tide, Hurricane parameters.

Available data can be used in calibrating a hydrodynamic-numerical surge model which can be used in extrapolating the surge response to an ensemble of hypothetical storms. Frequency information is provided by specification of the hurricane climatology of the region. A quasi one-dimensional, numerical-hydrodynamic model of storm surge in the Cape Fear River, North Carolina, was formulated as an aid in determining storm tide frequencies. Separate momentum balances are maintained for the main channel and the adjacent shallows. Input at the ocean was specified from a hydrograph computed from the storm surge model, linearly combined with the astronomical tide. Verification was made for the astronomical tide and hurricanes Hazel, Diane, and Helene. Significant interaction between the hurricane surge and the astronomical tide was indicated. (Singh-ISWS)
W77-04898

WATER DRAG ON ARCTIC SEA ICE,
McGill Univ., Montreal (Quebec). Ice Research Project.
For primary bibliographic entry see Field 2C.
W77-04901

EFFECTS OF ENERGY-RELATED ACTIVITIES ON THE ATLANTIC CONTINENTAL SHELF,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 6G.
W77-04934

WIND-DRIVEN AND THERMOHALINE CIRCULATION OVER THE CONTINENTAL SHELVES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 6G.
W77-04937

TIDAL WATER MOVEMENTS,
Dalhouse Univ., Halifax (Nova Scotia). Dept. of Oceanography.
C. J. R. Garrett.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 48-58, June 1976. 4 fig, 35 ref.

Descriptors: *Tidal effects, *Resources development, *Mathematical models, *Baseline studies, Continental shelf, Tidal waters, Sediment transport, Mixing, Dispersion.
Identifiers: *Outer Continental Shelf, *energy resources, Atlantic Continental Shelf, Bay of Fundy, Gulf of Maine, Internal tides.

Tides on a continental shelf are largely excited by deep-ocean tides, with direct astronomical forcing playing a minor role. The principles of the excitation, and the appropriate matching conditions between shelf and ocean, are described. The type of data necessary for development of a numerical model of tides in a shelf region is discussed. Observations and models of tides on the Atlantic Continental Shelf are summarized, and the different roles that will be played in the future by further observations and by numerical models are outlined. Mixing and dispersion processes due to surface tides and to the large-amplitude internal tides generated at the continental slope are outlined. Quite apart from the effect of tides on offshore development, the influence of large-scale engineering projects on the tides themselves must often be examined. This point is illustrated by a discussion of the surprising effects that tidal power development in the Bay of Fundy is predicted to have on the tides of the Gulf of Maine. (See also W77-04934) (Sinha-OEIS)
W77-04938

AN INTRODUCTION TO SHEAR FLOW DISPERSION AND ITS RELEVANCE TO DISPERSION ON THE CONTINENTAL SHELF,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04939

REVIEW OF OIL SPREADING ON THE SEA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W77-04940

PLANKTON PROCESSES IN MID-ATLANTIC NEARSHORE AND SHELF WATERS AND ENERGY-RELATED ACTIVITIES,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04941

PETROLEUM, TEMPERATURE, AND TOXICANTS: EXAMPLES OF SUSPECTED RESPONSES BY PLANKTON AND BENTHOS ON THE CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04942

STRUCTURE AND STABILITY IN THREE MARINE BENTHIC COMMUNITIES IN SOUTHERN NEW ENGLAND,
Marine Biological Lab., Woods Hole, Mass.
For primary bibliographic entry see Field 5C.
W77-04943

PATTERNS OF LARVAL FISH DISTRIBUTIONS IN THE MIDDLE ATLANTIC BIGHT,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 6G.
W77-04944

FISHERIES AND RENEWABLE RESOURCES OF THE NORTHWEST ATLANTIC SHELF,
National Marine Fisheries Service, Woods Hole, Mass. Northeast Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-04945

SOME ASPECTS OF BOTTOM SEDIMENT TRANSPORT MECHANICS ON THE CONTINENTAL SHELF,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.

R. L. Miller.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 167-184, June 1976. 6 fig, 1 tab, 50 ref.

Descriptors: *Sediment transport, *Bottom sediments, *Baseline studies, *Resources development, *Continental shelf, Boundary layers, Geology.
Identifiers: *Outer Continental Shelf, *Energy resources, *Atlantic Continental Shelf, Environmental factors.

Attention is focused on the structure of the boundary layer on the continental shelf and its role in the prediction of initial sediment motion. A brief discussion of initial sediment motion in uniform flow is given by way of introduction. An attempt has been made to gather together the scaling and related properties of the bottom boundary layer on the continental shelf. Particular attention is paid to the aspects that relate directly to sediment transport. It is evident that gaps appear and that a systematic program of field measurements is needed especially to establish typical thickness of the logarithmic region of the boundary layer. The scaling chart should serve as necessary background for the proper design of instruments for field measurements and as a basis for selection of appropriate boundary conditions and general criteria for proper construction of numerical prediction models. (See also W77-04934) (Sinha-OEIS)
W77-04946

BEDFORMS ON THE U.S. ATLANTIC CONTINENTAL SHELF: A REVIEW,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Sea Grant.
For primary bibliographic entry see Field 6G.
W77-04947

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENTS,
State Univ., of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, N.Y. Nov 10-12, 1975, p 207-230, June 1976. 9 fig, 39 ref.

Descriptors: *Sediment transport, *Oil pollution, *Resources development, *Baseline studies, Radionuclides, Water pollution, Nuclear powerplants.
Identifiers: *Outer Continental Shelf, *Energy resources, Suspended matter, Literature reviews, Atlantic Continental Shelf, Environmental impact.

The primary purposes of this paper are (1) to briefly review the literature on the suspended matter of the waters overlying the Atlantic shelf of the United States, (2) to assess the significance of suspended matter as a mechanism for transporting oil and radionuclides back to the coast and therefore to man, and (3) to determine whether additional studies of suspended-matter dispersal systems are required for preparation of environmental impact statements that would be associated with siting of nuclear power plants and oil drilling on the Atlantic shelf. The paper is largely a review paper, but some new data are presented. A number of studies of the distribution and character of suspended matter in the waters of the Atlantic shelf show that concentrations of total suspended matter are so low that the mechanism for the transfer of energy-associated contaminants back to the coast is ineffective. It is the opinion of the author that the state of knowledge is adequate for the preparation of environmental impact statements. (See also W77-04934) (Sinha-OEIS)
W77-04948

LABORATORY EXPERIMENTS ON THE EFFECTS OF OCEAN DUMPING ON BENTHIC INVERTEBRATES. I. CHOICE TESTS WITH SOLID WASTES,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W77-04949

NUMERICAL MODEL OF THE SALT-WEDGE REACH OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-04973

ESTUARIAL MODELS,
Resource Management Associates, Lafayette, Calif.
G. T. Orlob.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 253-293 (Chapter 7), McGraw-Hill, New York, N.Y., 1976. 15 fig, 1 tab, 38 ref.

Descriptors: *Water quality control, *Estuaries, *Ecology, *Mathematical models, *Simulation analysis, Biochemical oxygen demand, Dissolved oxygen, Advection, Diffusion, Hydrodynamics, Equations, Systems analysis.
Identifiers: Water quantity, Tidal motion, Delaware Estuary Model, Bay-Delta Models, Gulf Coast Models.

The estuary is doubtless the most complex system with which the water resources analyst must deal. Predicting the behaviour of the estuarial system has challenged investigators for years. Physical hydraulic models, although useful in describing effects of physical changes, have not been able to deal with the important dimension of quality. However, modern computational capability has yielded mathematical models of estuarial systems, solvable on digital computers, which have become the most useful tools for dealing with the problems of quality. Described are some basic theoretical considerations upon which most of the current models are founded, considering both quantity and quality relationships and introducing some new concepts of ecological modelng as applied to estuaries. The history of estuarial model development is briefly reviewed, summarizing the work of four major groups of investigators in the United States in terms of the scope of practical application of their models. Case studies using these models are then reviewed. Covered in this chapter are the Delaware Estuary Model, the Bay-Delta Models, the Gulf Coast Models, the Triangular-Element Hydrodynamic Model, and the Estuary Ecologic Model. (See also W77-05008) (Bell-Cornell)
W77-05015

SURVEY OF MARINE COMMUNITIES IN PANAMA AND EXPERIMENTS WITH OIL,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
For primary bibliographic entry see Field 5C.
W77-05020

SOME BIOCHEMICAL CHARACTERISTICS OF THE WATER IN THE CARIACO TRENCH, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
T. Okuda, J. B. Ruiz, and A. J. Garcia.
Bol Inst Oceanogr Univ Oriente Cumana 13(1/2), p 163-174, 1974.

Descriptors: Biochemistry, South America, *Phosphates, *Nitrification, *Denitrification, *Sulfates, Model studies.
Identifiers: *Sulfate reduction, *Cariaco Trench(Venezuela).

Biochemical processes within the nitrification, denitrification and So4 reduction zones in the Cariaco Trench (Venezuela) were studied on the basis of hydrochemical observations carried out on board the R/V LA SALLE in April 1970, March and Aug. 1971 and Sept. 1972. Nitrification processes were encountered in the upper layer (from the surface to about 175 m) with O2 concentration between 3.0-4.0 ml/l. Denitrification processes appear in the layer between 175-320 m when the O2 content reduces to less than 1.4 ml/l and NO3 disappears at an O2 value lower than 0.4 ml/l. Sulfate reduction occurs from a depth of about 320 m to the bottom with concurrent accumulation of NH3 when the O2 concentration is less than 0.14 ml/l. In the nitrification zone there is good correlation between the inorganic N observed and calculated from phosphate concentrations based on the ratio, N:P = 16:1. In the denitrification and SO4 reduction zones, the observed values of inorganic N were considerably lower than the calculated values. This may be the results of the production of molecular N. Under the denitrification process, there is no good correlation between the NO3 reduction and the increase in phosphate concentration. There is a better correlation between the increase in phosphate and the oxidation equivalents. In the SO4 reduction zone, there is a good correlation between the concentrations of sulfide and ammonia, as well as between the ammonia and phosphate concentrations. The elemental ratios obtained, S:N:P = 29:17:1, differ from the 53:16:1 ratios predicted by Richard's model.--Copyright 1976, Biological Abstracts, Inc.
W77-05021

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1973.
California State Resources Agency, Sacramento; and California State Dept. of Water Resources, Sacramento.
Delta-Suisun Bay Ecological Studies, Methods and Data for 1973, July 1975. 412 p.

Descriptors: *Bays, *Water quality, *Estuaries, *California, *Ecology, *Water analysis, *Baseline studies, Data collections, Coasts, Resources development.
Identifiers: Delta-Suisun Bay, San Francisco Bay, Coastalzone.

The Delta-Suisun Bay Ecological Studies are conducted jointly by the United States Bureau of Reclamation (USBR) and the California State Department of Water Resources (DWR). This volume of the joint water quality data report of the USBR-DWR Coordinated Monitoring Program consists of two parts: The first is a methodology documentation of the collection, preservation, and analysis procedures used in obtaining data presented in this and previous reports. This section will be updated and published along with future reports containing water quality data. The second is a tabulation of data collected in the field. Future data will be published in similar reports. (Sinha-OEIS)
W77-05022

BIOLOGICAL IMPACT CAUSED BY CHANGES ON A TROPICAL REEF,
Guam Univ., Agana. Marine Lab.
For primary bibliographic entry see Field 5C.
W77-05027

THE ECOLOGICAL IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, Fla.
For primary bibliographic entry see Field 5C.
W77-05028

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 5-6, 1974,
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 6B.
W77-05029

THE (COASTAL PLAINS REGIONAL CENTER) DEEPWATER TERMINAL STUDY,
Coastal Plains Regional Commission, Washington, D. C.
For primary bibliographic entry see Field 6B.
W77-05030

RESPONSIBLE DEVELOPMENT AND REASONABLE CONSERVATION,
For primary bibliographic entry see Field 6B.
W77-05031

A VIEW OF CARACAS,
Deepsea Ventures, Inc., Gloucester Point, Va.
For primary bibliographic entry see Field 6E.
W77-05032

COASTAL PLANNING FOR PLEASURE BOATING,
Rhode Island Univ., Narragansett. New England Marine Resources Information Program.
For primary bibliographic entry see Field 6B.
W77-05033

NORTH CAROLINA'S COASTAL AREA MANAGEMENT ACT,
North Carolina State Dept. of Administration, Raleigh. Office of Marine Affairs.
For primary bibliographic entry see Field 6E.
W77-05034

COASTAL PROCESSES AND CHANGE: LEGAL IMPLICATIONS,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 6E.
W77-05040

JUDICIAL DECISION MAKING AND THE ADMINISTRATION OF COASTAL RESOURCES,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 6E.
W77-05041

FLORIDA WATER AND RELATED LAND RESOURCES KISSIMMEE--EVERGLADES AREA,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4B.
W77-05048

INTERIM CLASSIFICATION OF WETLANDS AND AQUATIC HABITATS OF THE UNITED STATES,
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-05049

OREGON COASTAL ZONE LAND: USE, OWNERSHIP, AND VALUE CHANGE,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
For primary bibliographic entry see Field 6B.
W77-05058

COASTAL ZONE MANAGEMENT AND INTERGOVERNMENTAL COORDINATION,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
For primary bibliographic entry see Field 6E.
W77-05059

THE INTERNATIONAL SEABED AND THE SINGLE NEGOTIATING TEXT,
University of Wales Inst. of Science and Technology, Cardiff.
For primary bibliographic entry see Field 6E.
W77-05060

INVESTIGATIONS ON THE PHYTOPLANKTON OF THE NORTHERN CENTRAL ATLANTIC: I. THE PHYTOPLANKTON OF THE OFFSHORE REGION AT 30 W RELATED TO A FEW ENVIRONMENTAL FACTORS DETERMINING THE PRODUCTION, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W77-05097

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

BRINE DESALINATION PROCESS WITH PHASE-BREAKING BY COLD HYDROCARBON INJECTION,
Texaco Inc., New York. (Assignee).
H. V. Hess, and W. F. Franz.
U.S. Patent No. 3,983,032, 4 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 950, No 4, p 1549, September 28, 1976.

Descriptors: *Patents, *Desalination processes, *Separation techniques, Saline water, Water purification, Water treatment, Water quality control, Desalination, Organic compounds, *Brines.
Identifiers: *Aliphatic hydrocarbons.

A process for extracting fresh water from brine consists of passing the brine into countercurrent contact with hot hydrocarbon under pressure of 700 to 2500 psig at a temperature of 500 to 650 deg F in a first contacting zone. A hydrocarbon-water solution is formed was well as concentrated brine and a cooled recycle hydrocarbon at a temperature of 70 to 200 feg F. The improvement which consists in injecting the solution directly with substantially all of the cooled hydrocarbon causes the solution to separate into water and hydrocarbon. The hydrocabron can be recycled and the water is flash evaporated to yield steam for power genration. The steam, after use for powr generation can be recovedered as fresh water. (Sinha-OEIS)
W77-04951

APPARATUS FOR CONTROLLING MARINE FOULING OF SALT WATER COOLANT HEAT EXCHANGERS, PIPING SYSTEMS, AND THE LIKE,
General Dynamics Corp., Groton, Conn. (Assignee).
For primary bibliographic entry see Field 8G.
W77-04956

MEMBRANE SEPARATION EQUIPMENT,
Dorr-Oliver Inc., Stamford, Conn. (Assignee).
P. J. Hubbard, and E. L. Sandstrom.
U.S. Patent No. 3,984,319, 10 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 951, no 1, p 259, October 5, 1976.

Descriptors: *Patents, *Membrane processes, *Reverse osmosis, *Desalination, *Waste water treatment, Filtration, Membranes, Semipermeable membranes, Equipment, *Separation techniques, Food processing industry.
Identifiers: Membrane separation equipment, Ultrafiltration.

Membrane separation equipment is used in a wide variety of reverse osmosis and ultrafiltration processes. Among the uses of this equipment are: treatment of waste water, desalnation processes, and food processing such as treatment of cheese whey. A varity of structures or cartridge assemblies have been used for supporting the membranes. Membrane filtration is limited by its casing construction and cartridge structure and as a result the capability of circulating the carrier liquid through the casing is limited and there is a corresponding decrease in the volume of liquid that can be processed through the unit. This invention provides a canister casing for housing cartridges supporting semipermeable membrane separation surfaces in parallel-series relationshlp. Ready releasable attching means are provided for locating and securing the cartridges to the sidewalls of the casing. A central impeller pump provides circulation for a carrier liquid supplied to the canister across the membrane surfaces. Flow directing means are arranged within the casing for controlling and properly channeling the circulating liquid. (Sinha-OEIS)
W77-04963

3B. Water Yield Improvement

LAND SURFACE MODIFICATIONS AND THEIR EFFECTS ON RANGE AND FOREST WATERSHEDS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 4D.
W77-04780

3C. Use Of Water Of Impaired Quality

EVALUATION OF THE USE OF SLUDGE CONTAINING PLUTONIUM AS A SOIL CONDITIONER FOR FOOD CROPS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5D.
W77-04649

SALINIZATION OF NEWLY-IRRIGATED DESERT SOILS IN THE KHAUZKHAN TRACT, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
K. Redzhepbaev, D. Orazdurdyey, and P. Esenov.
Probl Osvo Pustyn' 5, p 51-57, 1975.

Descriptors: *Salinity, Soil profiles, *Salts, Irrigated lands, Saline soils, Deserts, *Land use, Land reclamation.
Identifiers: *Khauzkhan Tract(USSR), Turkmen-Ssr, USSR, *USSR(Turkm SSR).

Salinization of newly-irrigated lands of the Khauzhan (USSR) tract caused salt accumulations in the surface and profile of the soil. Elimination of excess water soluble salts and application of progressive land use methods are the principal ways to improve soil.--Copyright 1976, Biological Abstracts, Inc.
W77-04781

TRIALS OF DRYLAND FODDER BEET IN CYPRUS,
Agricultural Research Inst., Nicosia (Cyprus).
A. Hadjichristodoulou.
Experimental Agriculture, Vol. 12, No. 1, p 61-67, January, 1976. 5 tab, 6 ref.

Descriptors: *Competing uses, *Forages, *Crop production, *Semiarid climates, Forage legumes, Irrigation, Irrigation water, Irrigation effects, Irrigation practices, Saline water, Impaired water

use, Crop response, Soil types, Sodium compounds, Cereal crops, Calcareous soils, Sands, *Saline soils.
Identifiers: *Beets, *Cyprus.

In the semiarid regions of the Mediterranean countries, where the period from June to October is completely dry, there is a shortage of good quality forage during these summer months because of competition for irrigation water by other more profitable crops. The possibility of growing fodder beet under rainfed conditions during the winter season to produce summer forage was examined. Experiments were conducted in Cyprus over a seven-year period in slightly alkaline calcareous alluvial fine-textured soils. A few trials were also carried out in soils of medium texture (loam), and on sandy soils. Experiments included: variety, spacing, and optimum harvest date trials and supplementary irrigation trials. Results presented indicate that rainfed fodder beets can significantly outyield both cereals and legumes. The conclusion is reached that dryland fodder beet is a promising crop for semiarid regions like Cyprus because it produces more dry matter than rainfed forage cereals and legumes, and more feed units than grain barley, and is available in the dry summer. (Jamail-Arizona)
W77-04785

IRRIGATED FORAGE PRODUCTION UNDER EXTREME ARID ZONE CONDITIONS IN SAUDI ARABIA,
University College of North Wales, Bangor. Dept. of Agriculture.
J. Farnworth.
Experimental Agriculture, Vol. 12, No. 2, p 177-187, April, 1976. 1 fig, 16 tab, 17 ref.

Descriptors: *Forage grasses, *Irrigation effects, *Arid lands, *Irrigation efficiency, Irrigation, *Irrigation water, Fertilizers, Evaportranspiration, Forage, Crop response, Feeds, Leaching, *Saline water, *Saline soils, Impaired water use, Drainage, Land reclamation, Forage sorghum, Alfalfa, Phosphates, Nitrogen, Barley, Grains(Crops), Planting management.
Identifiers: *Saudi Arabia.

The potential for forage production under irrigated conditions in extremely arid climates was investigated. Climate, soil conditions and irrigation practices are discussed as background for the experimental data. Experiments were carried out on basin plots in Saudi Arabia and the principal results of the first 4 years of field experiments are discussed. Both temperate and tropical annual forages as well as perennial species were tested, and generally produced high yields with nutritional value. Fertilizer responses and different management practices were evaluated and their relevance to the development of systems of forage production are discussed. The conclusion is reached that under the extreme arid zone conditions of Hofuf, Saudi Arabia, with its acute problems of saline irrigation water and saline soils with poor drainage characteristics, it is possible to grow a wide range of forage species provided the water supply is adequate. (Jamail-Arizona)
W77-04786

EFFECT OF SODIUM ON THE GROWTH OF AND ION UPTAKE BY BARLEY, SUGAR BEET AND BROAD BEANS,
Rothamsted Experimental Station, Harpenden (England).
A. Hamid, and O. Talibudeen.
Journal of Agricultural Science, Vol. 86, No. 1, p 49-56, February, 1976. 4 fig, 3 tab, 29 ref.

Descriptors: *Ion transport, *Salinity, *Salt tolerance, *Electrical conductance, *Saline soils, *Sodium, Arid lands, Crop response, Crop production, Conductivity, *Sugar beets, *Barley, Economic efficiency, *Beans, Growth stages, Water utilization, Soil-water-plant relationships, Absorption.

The effects of soil salinity on the growth and composition of barley, sugar beet, and broad beans, crops that differ greatly in their reaction to salinity, were studied in an attempt to define critical soil electrical conductivity at which growth is seriously affected. The results of the greenhouse experiments indicate that barley and sugar beet yields benefited from the added sodium in the soil but broad beans were always adversely affected. The salinity and conductivity levels for the three crops tested are presented. Water use data are presented and indicate that water use by broad beans contrasted greatly with that of barley and sugar beet. At increased sodium chloride concentrations, total water use by broad beans decreased much more sharply, but transpiration remained constant except for a significant increase at the highest sodium chloride concentration. Greater sodium uptake promoted increases in dry matter yields of all plant parts of barley and sugar beet, indicating that sodium played a specific role in their metabolism. It is concluded that the effects caused by sodium salts when water is not limiting, are related not only to plant species, but also to their stages of growth. (Jamail-Arizona)
W77-04787

RECLAMATION OF WATER FROM WASTES IN SOUTHERN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5D.
W77-04850

LAND AND WATER USE IMPACTS ON GROUND-WATER QUALITY IN LAS VEGAS VALLEY,
Office of Radiation Programs. Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W77-04891

THE EFFECT OF NAC1 ON THE CONCENTRATION OF PROLINE IN DIFFERENT HALOPHYTES, (IN GERMAN),
Technische Hochschule, Darmstadt (West Germany); and Technische Hochschule, Darmstadt (West Germany). Botanisches Institut.
For primary bibliographic entry see Field 2I.
W77-04912

3D. Conservation In Domestic and Municipal Use

THE COST OF MUNICIPAL WATER SUPPLY: A CASE STUDY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5F.
W77-04643

STORMWATER TUNNEL CUTS DRAINAGE COSTS.
For primary bibliographic entry see Field 5D.
W77-04654

NO SEWERS--NO GROWTH,
For primary bibliographic entry see Field 5G.
W77-04666

AWT AT WOODLANDS, TEXAS,
Houston Univ., Tex. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-04690

WHITHER VILLAGE SEWAGE,
For primary bibliographic entry see Field 5D.
W77-04698

QUANTITY ASPECTS OF URBAN STORM-WATER RUNOFF,
Espey, Huston, and Associates, Inc., Austin, Tex.
For primary bibliographic entry see Field 4A.
W77-04732

QUALITY ASPECTS OF URBAN STORM-WATER RUNOFF,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-04733

WATER DEEDS: A PROPOSED SOLUTION TO THE WATER VALUATION PROBLEM,
Arizona Univ., Tucson, Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-04792

THE ENTITLEMENT TO MUNICIPAL WATER SERVICE: CONSTITUTIONAL PROBLEMS IN THE DETERMINATION OF A PUBLIC UTILITY SERVICE,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
For primary bibliographic entry see Field 6E.
W77-05053

3E. Conservation In Industry

INDUSTRIAL EFFLUENT TREATMENT: PHYSICO-CHEMICAL AND BIOCHEMICAL OPTIONS, (PART II),
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W77-04633

STUDIES ON MAGNESIUM-BASED SEMICHEMICAL PULPS (4) - THE CHEMICAL RECOVERY FROM THE WASTE LIQUORS AND THEIR REUSE,
Kyushu Univ., Fukuoka (Japan).
For primary bibliographic entry see Field 5D.
W77-04634

EFFLUENT AND WATER TREATMENT: THE ECONOMICS OF LIME DOSING AND IN-HOUSE WASTE TREATMENT.
For primary bibliographic entry see Field 5D.
W77-04699

GENERATION OF ELECTRICAL ENERGY FROM MUNICIPAL REFUSE AND SEWAGE SLUDGE,
Burns and McDonnell, Kansas City, Mo.
J. E. Ruf, and H. T. Brown.
Public Works, Vol. 108, No. 1, p 38-41, January, 1977. 1 fig, 2 tab.

Descriptors: *Sewage treatment, *Electric power production, *Sewage sludge, *Municipal wastes, *Energy, Electricity, Sludge treatment, Economics, Waste water treatment.
Identifiers: *Energy recovery, Materials recovery.

Design considerations are discussed for a proposed energy recovery system involving incineration of mixed solid waste and dried sewage sludge. Designs are based on filter press dewatering and direct drying of vacuum filtered sludge. Filter presses were estimated to provide sludge with a 40% solids content and a higher heating value (HHV) of 2500 Btu/pound. Dried sludge estimates were an 85% slids content and a HHV of 6400 Btu/pound. Costs to power companies for energy produced was suggested to be $0.015 per KWH for firm energy and $0.008 per KWH (1976

prices). A concurrent materials recovery process was considered due to its compatibility with energy recovery processes. Ferrous metals recovery is now feasible and aluminum recovery should be effective before 1980. Alternative systems which were devised included the grate-fired waterwall incinerator, suspension-fired waterwall incinerator, and the 'Purox' pyrolysis system. Economic factors such as annual operation and maintenance costs and annual credits were discussed and evaluated. (Collins-FIRL)
W77-04705

REDUCTION IN VOLUME OF VISCOSE-ALKALI EFFLUENTS AND THEIR PURIFICATION (UMEN'SHENIE KOLICHESTVA VISKOZNO-SHCHELOCHNYKH STOKOV I IKH OCHISTKA),
For primary bibliographic entry see Field 5D.
W77-04808

WATER AND PAPER (L'EAU ET LE PAPIER),
For primary bibliographic entry see Field 5D.
W77-04812

OPPORTUNITIES AND RISKS OF CLOSING THE WATER CYCLE IN PAPER MILLS (CHANCEN UND RISIKEN DER WASSERKREISLAUFSCHLIESSUNG IN PAPIERFABRIKEN),
Technische Universitaet, Darmstadt (West Germany). Institut fuer Paperfabrikation.
For primary bibliographic entry see Field 5D.
W77-04815

SULFITE VERSUS KRAFT FROM THE POINT OF VIEW OF ENVIRONMENTAL PROTECTION (SULFIT VERSUS SULFAT AUS DER SICHT DES UMWELTSCHUTZES),
VIBCONSULT A. G., Zollikon (Switzerland).
For primary bibliographic entry see Field 5D.
W77-04816

WASTEWATER PROBLEMS AND ECONOMY (ABWASSERPROBLEME UND WIRTSCHAFTLICHKEIT),
Rondo Ganahl A.G. (Austria).
For primary bibliographic entry see Field 5D.
W77-04818

HOW TO REDUCE STEAM CONSUMPTION IN THE PAPER MILL MACHINE ROOM,
Midland-Ross of Canada Ltd., LaSalle (Quebec). Air Systems Div.
P. J. R. Walker.
Pulp and Paper, Vol 50, No 11, p 134-138, October, 1976. 7 tab.

Descriptors: *Pulp and paper industry, *Steam, *Water conservation, *Energy, Conservation, Water reuse, Technology, Return(Monetary), Water pollution sources, Water pollution control, Industrial water.
Identifiers: Paper mills, Machine rooms(Paper mill), Paper machines, *Heat recovery.

A well-planned energy-conservation program consists of fact-finding, analysis, and implementation stages. During the fact-finding stage, data are collected to give the mill engineer a reasonable idea of where the energy is being consumed. In the second stage, the data are analyzed to detemine exactly where and how much energy is consumed in the mill and to establish the best energy investments. The final stage involves instituting programs for energy conservation. Application of this procedure to a 100 ton/day paper mill reduced energy use by 43% through a series of energy conservation steps (enclosing the paper machine, recirculation of more process water, introductin of less fresh water, more heat recovery, etc.). Te energy-conserving steps taken in the mill used available technology, and the investments achieved excellent rates of return. (Witt-ICP)
W77-04822

NSSC RECOVERY PROCESS ELIMINATES FIVE-DAY BOD 5 LOAD AND RECOVERS CHEMICALS,
Sonoc Products Co., Hartsville, S. C.
For primary bibliographic entry see Field 5D.
W77-04826

ENVIRONMENTAL CONCERNS OF (SWEDISH) WOOD-PROCESSING INDUSTRIES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5G.
W77-04828

ENVIRONMENTAL CONCERNS OF WOOD-PROCESSING INDUSTRIES (IN AUSTRIA),
Bundeskammer der Gewerblichen Wirtschaft, Vienna (Austria).
For primary bibliographic entry see Field 5G.
W77-04829

MILL VISIT TO HAINDL PAPIER GMBH AT SCHONGAU (BESICHTIGUNG DES WERKES SCHONGAU DER HAINDL PAPIER GMBH).
For primary bibliographic entry see Field 5D.
W77-04830

CONSERVATION AS A MAJOR ALTERNATIVE,
Brookhaven National Lab., Upton, N.Y.
K. C. Hoffman.
Report No. BNL-20566, October 1975. 13 p. 4 tab.

Descriptors: *Conservation, *Electric power demand, *Electric power, *Fuels, Electric power industry, Electric powerplant, Nuclear powerplants, Hydroelectric plants, Electric power production, Peaking capacity, Peak loads, Peak power, Electric power costs, Fossil fuels, Resource allocation, Regulation, Comparative costs, Projections, Energy.

The implications of conservation as an alternative to nuclear power are that the former is in reality only an alternative to the wasteful use of energy. However, a strong conservation movement may reduce the level to which any specific supply options must be developed as a given future. Three components of conservation are considered: (1) conservation of all energy forms; (2) conservation of scarce energy resources such as oil and gas; and (3) conservation of electric power. Each component requires a different set of strategies, i.e., the development of more efficient energy conversion and utilization technologies for the first component, a strategy of interfuel substitution for the second and increasing the overall system load factor for the third. The third component is extremely capital intensive because of the characteristics of electric demand, the instaled generating capacity is used at only about 50% capacity. In view of the severe capital limitations foreseen, it will be necessary to increase the utilization of these generating facilities and a target of 60% for 1985 is realistic. An increase of this magnitude can be attained by a combination of peak load marginal cost pricing, load management to encourage the shift of peak demands to off-peak periods, and the use of storage to shift generating demands from peak to off-peak times. (Harris-Wisconsin)
W77-04854

WASTED HEAT AND AQUATIC ECOSYSTEMS,
Atkins Research and Development,Epsom (England).
For primary bibliographic entry see Field 5C.
W77-04869

THE ROCKY ROAD TO WATER FOR ENERGY,
Loble, Picotte and Pauly, Helena, Mont.
H. Loble, and C. B. Loble.
North Dakota Law Review, Vol 52, No 3, p 529-62 (1976).

Descriptors: *Governmental interrelations, *Energy, *Water allocation(Policy), *Coal mines, Industrial wastes, Wastes, Water pollution sources, Acidic water, Interstate rivers, Interstate, Water law, Appropriation, Water rights, Reservation doctrine, Rivers and Harbors Act, Rivers, Water quality standards, Federal government, Federal jurisdiction.
Identifiers: *Administrative regulations, Wild and Scenic Rivers Act.

This article examines the procedures involved and the problems posed by appropriation of waters for energy in Montana, Wyoming and North Dakota. Low sulfur coal resources in the Northern Great Plains Region are enormous, but mining such coal requires large amounts of water. Appropriation and use of the available water for energy development involves complex procedures on the state and federal levels. State laws vary concerning diversion of waters for use in another state. Some states have adopted the prior appropriation doctrine, rather than the riparian doctrine. The federal government has allowed the states to determine the granting or witholding of water right appropriations as modified by the reserved rights doctrine for federal and Indian claims. Both the Rivers and Harbors Act and the National Wild and Scenic River System Act affect water appropriation for energy development. The authors evaluate various problems, indluding those between the states, those concerning water in federal reservoirs, and those affecting the environment. The authors suggest that the difficulties in solving the energy crisis are compounded by the procedural complexities involved in water appropriation for energy development. Consideration may have to be given to reducing the paper work, cutting down on the delays, and devoting time and money to the actual development of energy. (Welch-Florida)
W77-04904

METHODOLOGY AND CRITERIA FOR SITING ENERGY PLANTS IN IDAHO,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W77-05006

3F. Conservation In Agriculture

THE METHOD OF CALCULATING WATER-ABSORBING FOREST BELT UNDER TROPICAL CONDITIONS OF CUBA, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Lesovodstva i Mekhanizatsii Lesnogo Khozyaistva, Pushkino (USSR).
For primary bibliographic entry see Field 4A.
W77-04747

THE PULSED IRRIGATION PRINCIPLE FOR CONTROLLED SOIL WETTING,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W77-04770

NO-TILL IN THE GREAT PLAINS: IMPROVE PRODUCTION WITHOUT IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
D. G. Hanway.
Crops and Soils, Vol. 29, No. 2, p. 11-12, November, 1976.

Descriptors: *Water conservation, *Soil conservation, *Cultivation, *Farm management, *Deep til-

lage, Crop production, Irrigation, Irrigation effects, Range management, *Great Plains, Evaporation, Transpiration, Agriculture, Soil management, Land use, Dry farming, Crops.

Production in the U.S. Great Plains has extended greatly since the dust bowl of the 1930's, partly due to irrigation. But this may be coming to an end because of a declining water table and higher costs and decreasing availability of fuel to run irrigation pumps. Some presently irrigated areas will have to revert to dryland production, necessitating the elimination of tillage. Effects of this curtailment are discussed. Tillage wastes water, extremely important in areas of limited rainfall with high potentials for evaporation and transpiration of moisture. It has been used for weed control, but this can be accomplished by properly applied herbicides. Other suggestions include use of smaller tractors to reduce compaction of the soil, increased attention to control of rodents whose populations will increase without tillage, and the development of new crop varieties that will thrive in a no-till environment. The soil and water conservation benefits of no-till also aid production. The deterrents to no-till discussed include inadequate research and development of no-till practices, the lack of environmentally safe herbicides, the high cost involved in changing machinery, the need for the development of new varieties of crops for no-till cultivation, and a tradition that favors tillage. (Jamail-Arizona)
W77-04783

GYPSUM REQUIREMENT OF SODIC SOILS AND WATERS,
New South Wales Dept. of Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.
For primary bibliographic entry see Field 2G.
W77-04784

TRIALS OF DRYLAND FODDER BEET IN CYPRUS,
Agricultural Research Inst., Nicosia (Cyprus).
For primary bibliographic entry see Field 3C.
W77-04785

IRRIGATED FORAGE PRODUCTION UNDER EXTREME ARID ZONE CONDITIONS IN SAUDI ARABIA,
University College of North Wales, Bangor. Dept. of Agriculture.
For primary bibliographic entry see Field 3C.
W77-04786

WATER MANAGEMENT IN LINSEED,
Indian Agricultural Research Inst. (New Delhi). Div. of Agronomy.
I. C. Mahapatra, and N. P. Singh.
Indian Farming, Vol. 26, No. 3, p 19-20, June, 1976.

Descriptors: *Water management(Applied), *Oilseed crops, *Fiber crops, *Crop response, *Irrigation effects, Fibers(Plants), Irrigation, Root systems, Root development, Irrigation efficiency, Irrigation practices, Soil types, Grains(Crops), Feeds.
Identifiers: *Linseed, *India.

Linseed is important as a fiber crop, a source of oil, and as a feed for cattle. India is a major producing country of linseed, but grain yield is very low, mainly due to cultivation without irrigation and proper fertilization during periods of scarce and uncertain rainfall. Linseed plants have a certain capacity to adjust to drought conditions, probably by shedding their lower leaves, but the number of branches and number of capsules per branch are reduced appreciably resulting in lower yield per unit area. The crop, however, responds significantly to irrigation applications. Experiments were conducted in various areas of India under widely different soil and climatic conditions to study the effect of irrigations applied at different stages of growth. Only the highest yields obtained under different irrigation frequency groups applied at different stages are reported. Results indicate that depending upon climatic factors and rainfall during crop growth, linseed crops can be given one to four irrigations on light sandy loam soils of Delhi, one to two irrigations on black soils of Jabalpur, and one irrigation on tarai soils of Pantnagar for profitable grain production. (Jamail-Arizona)
W77-04788

SOIL STRUCTURAL BREAKDOWN UNDER IRRIGATION,
New South Wales Dept. of Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.
T. S. Abbott.
Agricultural Gazette of New South Wales, Vol. 87, No. 2, p 51-54, April, 1976.

Descriptors: *Irrigation effects, *Soil structure, Dispersion, *Slaking, Irrigation, Flood irrigation, Clays, Drying, Aeration, Pores, Soil compaction, Leaching, Irrigation practices, Sands, Gypsum, Alkaline soils, Water management(Applied), *Soil types, *Soil aggregates.
Identifiers: *Trickle irrigation.

An important factor to consider when choosing land for irrigation is soil type. Soil structural breakdown and ways to help prevent it are discussed. There are two main types of structural breakdown. The first is slaking, the breakdown in water of aggregates to smaller aggregates. It is caused partly by the air in the aggregate exploding out as water rushes in and partly by the swelling of clay particles in the aggregate. The second is dispersion, the breakdown in water of aggregates to individual sand, silt, and clay particles. The causes of structural breakdown and crusting are discussed in detail; a test for breakdown is described. If the problem is clay dispersion in clayey soils, it is likely that sodium levels are too high, and the application of gypsum will usually be helpful. Water management is another approach. When structural breakdown is a problem, soils should be flooded for as short a period as is practicable. Surface crusting and ways of lessening its effects are also discussed. (Jamail-Arizona)
W77-04789

SKIP FURROW IRRIGATION FOR COTTON,
Tamil Nadu Agricultural Univ., Coimbatore (India). Coll. of Agricultural Engineering.
R. K. Sivanappan, D. Chandrasekaran, and E. S. A. Saifudeen.
Indian Farming, Vol. 26, No. 3, p 11-13, June, 1976. 1 fig, 1 tab.

Descriptors: *Planting management, *Irrigation efficiency, *Irrigation practices, *Furrow irrigation, *Irrigation systems, Surface irrigation, Irrigation water, *Cotton, Crop production, Water delivery, Percolation.
Identifiers: *Skip furrow irrigation.

Furrow irrigation is adaptable to fine textured soils, where moisture can spread laterally without much deep percolation, and is suitable for row crops. Skip furrow irrigation, a type of furrow irrigation, involves the cultivation of an additional crop within the same furrow. It is theoretically possible to save 50 percent of the irrigation water without a significant reduction in yields. Field experiments were conducted to study the efficiency of skip furrow irrigation for cotton. The spaces available between pairs of furrows were intercropped with pulse without any exclusive irrigation. Water was applied to the field at 50 percent available moisture level, which was determined with a speedy moisture meter. Based upon the experimental studies, it was concluded that the skip furrow method is capable of saving 50 percent of irrigation water and with this savings in water, additional areas can be brought under irrigation. Space for intercropping is provided thereby increasing the total profit obtainable for a given unit of land. There is no significant difference in yield from the skip furrow method when compared to the conventional furrow method. (Jamail-Arizona)
W77-04791

EFFECT OF SOIL RECLAMATION ON HYDROPHYSICAL PROPERTIES OF DESERT TAKYR SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W77-04799

WATER REGIME OF CENTRAL KARA KUM SOILS IN CONNECTION WITH RANGELAND AFFORESTATION, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Inst. of Deserts.
For primary bibliographic entry see Field 2G.
W77-04855

EFFECT OF THE GROUNDWATER LEVEL AND SOIL MOISTURE CONTENT ON PHOTOPHOSPHORYLATION OF BARLEY, WHEAT AND OAT CHLOROPLASTS, (IN BELORUSSIAN),
For primary bibliographic entry see Field 2I.
W77-04884

DROUGHT EFFECT ON THE OPTICAL PROPERTIES OF WINTER WHEAT LEAVES, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
For primary bibliographic entry see Field 2I.
W77-04916

WHAT'S REALLY HAPPENING IN WESTLANDS,
For primary bibliographic entry see Field 6E.
W77-04921

DISTRIBUTION VALVE FOR IRRIGATION CHANNELS,
D. E. Benkert.
U.S. Patent No. 3,982,400, 9 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 950, No 4, p 1343, September 28, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Water delivery, Water control, *Valves, Remote control, Water distribution(Applied).

One or more domed valve closure members are made to open and close ports in the side walls of irrigation channels. Each closure member is cantilevered by a semi-flexible arm from a frame that has a pivot point lying in a plane substantially coincident with the plane of the sealing surface of the valve. A pneumatic bellows, which may be remotely controlled, exerts pressure to close the closure member against the sealing surface of the wall about the port. An adjustable limit stop fixes the degree of opening of the closure member as it swings arcuately away from the valve port to open. A manual control level with an adjustable limit stop and an over-center locking arrangement replaces or supplements the pneumatic closure arrangement. (Sinha-OEIS)
W77-04950

AUTOMATIC WATERING INSTALLATION,
H. R. Di Palma.
U.S. Patent No. 3,984,052, 18 p, 13 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 170, October 5, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Water distribution(Applied), Water control, Automation, Automatic control.

A watering installation which works automatically provides a movable carriage with a motor element, a front wheel, and a nozzle for throwing the water and which is connected to a coupling device, as well as a stationary water circuit including a pipe provided with outlet mouths distributed along its length. The front wheel is provided with guide means ensuring its cooperation with the pipe acting as a guide rail. The carriage has a retractable abutment arranged in such a way that it cooperates with each outlet mouth for stopping the carriage. A contact cooperates with each outlet mouth for moving the connector or coupling device of the nozzle and coupling it with each outlet mouth. (Sinha-OEIS)
W77-04955

CONTENT OF FREE AMINO ACIDS IN IRRIGATED AND UNIRRIGATED TYPICAL SIEROZEM SOILS, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W77-05045

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE NORTH PLATTE RIVER BASIN ECONOMIC SIMULATION MODEL (A TECHNICAL REPORT AND SUPPLEMENT TO THE TECHNICAL REPORT),
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W77-04601

STORMWATER MANAGEMENT LOOKS TO NATURAL DRAINAGE.
The American City and County, Vol 91, No 10, p 51-53, October, 1976. 2 tab.

Descriptors: *Water management(Applied), *Storm water, *Storm runoff, *Urban runoff, *Drainage systems, Flood control, Drainage area, Drainage practices, Detention reservoirs, Storage.

New trends in stormwater are discussed, with particular emphasis on detention, long-term equalization, and natural drainage. The objective of these solutions is to attenuate both peak and total short-term runoff and to reduce major facilities investments required for protecting against flood hazards in the lower portion of an urban drainage basin. The initial planning for a residential subdivision should begin with a study of the total drainage areas, with the major components of the system (streams, large depressions, lakes, and ponds) being located for an assessment of their stormwater management potential. During this phase, existing plans for stormwater management should be assessed both in terms of the effect of the subdivision drainage on basin-wide drainage and vice versa. Temporary storage can be achieved using rooftop and parking lot ponding; while ponds, reservoirs, and stream channels provide permanent storage. Street design in residential areas should take into account the functions of streets as part of the stormwater management system. Maximum use should be made of natural drainage. The installation of stormwater inlets should be delayed as long as possible because as soon as the runoff enters the pipe system it is carried rapidly downstream and may pose flood hazards in the lower part of the drainage basin. (Kreager-FIRL)
W77-04653

STORMWATER TUNNEL CUTS DRAINAGE COSTS.
For primary bibliographic entry see Field 5D.
W77-04654

FLOOD DAMAGE MITIGATION.
For primary bibliographic entry see Field 6F.
W77-04724

QUANTITY ASPECTS OF URBAN STORMWATER RUNOFF,
Espey, Huston, and Associates, Inc., Austin, Tex.
W. H. Espey, and D. E. Winslow.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 83-137. 13 fig, 7 tab, 73 ref.

Descriptors: *Analytical techniques, *Runoff, *Urban runoff, *Peak discharge, *Storm runoff, Storm water, Design, Drainage systems.
Identifiers: Peak storm flow.

Consideration must be given in designing drainage facilities to the required design to storm rainfall, the rainfall-runoff relationships as affected by the surface, and geometric characteristics of the watershed. The system must adequately dispose of all surface runoff from the design storm without serious damage to physical facilities or serious interruption of normal traffic. Runoff from storm exceeding the design storm must be disposed of with minimum damage to physical facilities and traffice interruption. The sytem must have maximum reliability of operation. The concept of rainfall excess, methods for determining rainfall excess, overland flow analysis, runoff hydrographs, urban drainage systems, open channel flow, and method of routing are discussed. Many urban design techniques consist of a combination of empirical, statistical, and theoretical methods. Urban hydrology literature is categorized as empirical/statistical formulas, flood frequency analysis, and simulation methods. empirical formulas are generally based on some form of hydrologic hypothesis; resulting relationships are developed by empirical derivation of equations and/or coefficients. Flood frequency equations have been developed which predict the peak flow for urban basins for selected recurrence intervals. Simulation methods generally attempt to describe in a somewhat analytical fashion the various physical processes involved in the generation of runoff. (See also W77-04730D) (Snyder-FIRL)
W77-04732

QUALITY ASPECTS OF URBAN STORMWATER RUNOFF,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-04733

THE METHOD OF CALCULATING WATER-ABSORBING FOREST BELT UNDER TROPICAL CONDITIONS OF CUBA, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Lesovodstva i Mekhanizatsii Lesnogo Khozyaistva, Pushkino (USSR).
V. A. Mel'chanov, and H. Erero.
Lesovedenie 6, p 74-79, 1975.

Descriptors: Absorption, *Forests, Methodology, Rivers, *Tropical areas, Grasses, Shrubs, Tobacco, Oranges, Pine trees, *Deciduous forests.
Identifiers: *Cuba(San Diego River), Yucca.

A formula for calculating the width of water-absorbing forest belts along the San Diego river is suggested. Forests stands for recommended on the lower 1/3 of slopes for the complete absorption of surface flow waters (Grass, shrubs, tobacco, orange groves, pasture land, yucca pine stands deciduous forests and mangoes are mentioned.)--Copyright 1976, Biological Abstracts, Inc.
W77-04747

DRAINAGE TO A WATER TABLE ANALYSED BY THE GREEN-AMPT APPROACH,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 2G.
W77-04762

CHANGES IN FOREST STRUCTURES IN THE EMMENTAL EXPRESSED IN THE TREE COUNT AND DISTRIBUTION AND THE POSSIBLE LONG-TERM DETERIORATION OF WATER UTILIZATION, (IN GERMAN),
Swiss Forest Research Inst., Birmensdorf.
A. Kurth.
Eidg Anst Forstl Versuchswes Mitt 51(1), p 141-146, 1975.

Descriptors: *Forests, *Climates, *Water utilization, Distribution, Trees, Conservation, Vegetation.
Identifiers: *Switzerland(Emmental).

The ecology, climate and vegetation of the Emmental (Switzerland) and the surrounding area lend themselves well to the selection method in which trees of all ages and developmental stages occur in a 2000-5000 m2 area. Suitable measures by local farmers every 8 yr are sufficient for maintaining this state in which significantly more small than large trees are present. Despite this, only 30% of the upper Emmental contains properly maintained selective forests, 20% is somewhat selectively maintained and 50% is not cared for. This situation may lead to the eventual disintegration of the protective function of the forest for the water table of the area.--Copyright 1976, Biological Abstracts, Inc.
W77-04778

SUMMARY, PHASE 1 - ARIZONA STATE WATER PLAN: INVENTORY OF RESOURCE AND USES.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W77-04782

BIG THOMPSON CANYON FLASH FLOOD OF JULY 30-AUGUST 1, 1976. A REPORT TO THE ADMINISTRATOR.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2B.
W77-04833

A SIMPLE DIAGNOSTIC MODEL TO DETERMINE THE FEASIBILITY OF SALINITY CONTROL OF EURASIAN WATERMILFOIL,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 5G.
W77-04848

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART C, LITTLE ARKANSAS RIVER BASIN,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6B.
W77-04851

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART B, KANSAS LONG RANGE WATER REQUIREMENTS.
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6B.
W77-04852

STATE OF DELAWARE NEW CASTLE COUNTY RIVER BASIN, WATER QUALITY MANAGEMENT PLAN.
Delaware State Dept. of Natural Resources and Environmental Control, Dover.
For primary bibliographic entry see Field 5G.
W77-04856

STATE OF DELAWARE SUSSEX COUNTY RIVER BASIN, WATER QUALITY MANAGEMENT PLAN.
Delaware State Dept. of Natural Resources and Environmental Control, Dover.
For primary bibliographic entry see Field 5G.
W77-04857

CONNECTICUT RIVER BASIN PROGRAM. PART III, PHASE I. WATER QUALITY RECONNAISSANCE FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass., Region I.
For primary bibliographic entry see Field 5G.
W77-04871

THE EFFECT OF VERTICAL SAND DRAINS ON THE HYDRAULIC RESISTANCE OF A SEMI-PERVIOUS LAYER,
International Water Supply Consultants, Rotterdam (Netherlands).
For primary bibliographic entry see Field 8D.
W77-04877

CLASSIFICATION OF NESTED TRIBUTARY BASINS IN ANALYSIS OF DRAINAGE BASIN SHAPE,
State Univ. of New York at Buffalo. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-04880

NATIONAL SYSTEMS OF WATER ADMINISTRATION.
Department of Economic and Social Affairs (UN), New York.
For primary bibliographic entry see Field 6E.
W77-04914

WHAT'S REALLY HAPPENING IN WESTLANDS,
For primary bibliographic entry see Field 6E.
W77-04921

FLOOD CONTROL REGULATIONS; MARSHALL FORD DAM AND RESERVOIR, COLORADO RIVER, TEXAS,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6F.
W77-04924

NAVIGATION REGULATION: OHIO RIVER, MISSISSIPPI RIVER ABOVE CAIRO, ILLINOIS AND THEIR TRIBUTARIES,
Corps of Engineers, Washington, D.C.
Federal Register, Vol 40, No 148, p 32121-24, July 31, 1975. 4 p.

Descriptors: *Navigation, *Regulation, *Locks, *Ohio River, *Mississippi River, Boats, Rivers, Tributaries, Navigable rivers, Ships, Federal government, Administrative agencies, Barges, Accidents, Safety, Oil spills, Floods, Buoys, Structures, Hydraulic structures, Gates, Wastes. Identifiers: *Administrative regulations.

The Department of the Army through the Corps of Engineers has amended the regulations governing the use, administration, and navigation of the Ohio River, the Mississippi River above Cairo, Illinois, and their tributaries. The regulations which deal with use of the navigation locks include: safety rules for vessels using the locks; procedures for reporting navigation incidents; the order of precedence for vessels using the locks; lockage of recreational crafts; simultaneous lockage of tows with other tows carrying dangerous cargoes; the positioning of vessels awaiting a lockage or access through a navigable pass; a list of signals to be used by vessels and by the locks; rules relating to mooring at the locks and outside of the locks; a prohibition on the discharge of refuse into the locks; the operation of vessels during high water and floods in designated vulnerable areas; and, the use of buoys at movable dams. The regulations pertaining to these various factors are set forth. (Capehart-Florida)
W77-04927

AUTOMATIC WATERING INSTALLATION,
For primary bibliographic entry see Field 3F.
W77-04955

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W77-04975

DETERMINATION OF CHANNEL CAPACITY OF THE SACRAMENTO RIVER BETWEEN ORDBEND AND GLENN, BUTTE AND GLENN COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-04977

DISTRIBUTION FUNCTIONS FOR STATISTICS DERIVED FROM BIVARIATE NORMAL AND BIVARIATE TWO-PARAMETER LOG-NORMAL POPULATIONS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-04978

PREDICTION OF SEDIMENT YIELDS IN WISCONSIN STREAMS,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04991

DEVELOPING CRITERIA TO CLASSIFY WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W77-04995

OUTDOOR RECREATION IN WATERSHED RESERVES,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-04996

GENERATION OF SYNTHETIC FLOW SEQUENCES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2E.
W77-05011

SURFACE-WATER QUANTITY MANAGEMENT MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
D. P. Loucks.
In: Systems Approach to Water Management, (Ed. by Asit K. Biswas), p 156-218 (Chapter 5), McGraw-Hill, Inc., New York, N.Y., 1976. 14 fig, 8 tab, 23 ref. OWRT-C-1640(No. 3151)(7).

Descriptors: *Multiple-purpose reservoirs, *Surface waters, *Mathematical models, *Optimization, *Alternative planning, *Regional analysis, *Economic efficiency, *Water management(Applied), River basins, Simulation analysis, Linear programming, Evaluation, Investment, Cost-benefit analysis, Computer models, Methodology, Water supply, Storage, Stochastic processes, Equations, Annual, Water yield, Streamflow, Probability, Water allocation(Policy), Water utilization, Agriculture, Flow augmentation, Navigation, Recreation, Demand, Constraints, Seasonal, Operations research.
Identifiers: Cost minimization, Benefit maximization, Damage reduction, Static models, Dynamic models, Deterministic models, Loss, Cost effectiveness, Hydropower, Mixed integer programming, Separable programming, Rule curves, *Preliminary screening.

Surface waters provide the major portion of the world's agricultural, industrial, and domestic water supplies and are the major cause of flood damage. This chapter deals with the quantity regulation of surface water, focusing on the definition and evaluation of alternatives for controlling the allocation and distribution of surface water flows. Presented are screening models to make preliminary estimates of: (1) the desired amount and reliability of various yields or allocations of water to each consumptive or nonconsumptive use; (2) the requirements for over-year as well as within-year reservoir storage capacity based on the sequence of historical or simulated flows; (3) the requirements for structural flood control measures and the desired level of flood protection at each potential damage site; and (4) the reservoir operating rule curves. Approximations are made to render the models compatible with currently available computer solution techniques and capacities; the emphasis is on models that can be readily applied by water resource planners, even in situations with limited data and computer capacity. Optimization procedures include linear programming, separable programming and mixed integer programming, and objective functions include benefit maximization, cost minimization and damage reduction. (See also W77-05008) (Bell-Cornell)
W77-05013

ECONOMIC MODELS,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W77-05017

MULTIOBJECTIVE WATER-RESOURCES PLANNING,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W77-05018

RESPONSIBLE DEVELOPMENT AND REASONABLE CONSERVATION,
For primary bibliographic entry see Field 6B.
W77-05031

NORTH CAROLINA'S COASTAL AREA MANAGEMENT ACT,
North Carolina State Dept. of Administration, Raleigh. Office of Marine Affairs.
For primary bibliographic entry see Field 6E.
W77-05034

INTERIM CLASSIFICATION OF WETLANDS AND AQUATIC HABITATS OF THE UNITED STATES,
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
L. M. Cowardin, V. Carter, F. C. Golet, and E. T. LaRoe.
March 1976. 110 p, 6 fig, 8 tab, 1 ref.

Descriptors: *Classification, *Wetlands, *Aquatic habitats, *Aquatic environment, Freshwater, Shallow water, Standing waters, Terrestial habitats, Wildlife conservation, Wildlife habitats, Systematics, Classification(Biological), Taxonomy, Habitats, Ecology, Intertidal areas, Estuarine environment, Speciation, Biological communities, Ecotypes, Ecosystems, Vegetation, Vegetation effects.
Identifiers: Circular 39, Classification structure, Province, Ecological system, Habitat class, Habitat order, Habitat type.

Since the 1954 U. S. Fish and Wildlife Service wetlands inventory, wetlands in the United States have undergone great natural and man-related changes. Consequently, in 1974 the Service directed its Office of Biological Services to conduct a new and more extensive national wetlands inventory. Poor definition of classes and the failure to make ecologically critical distinctions, such as between fresh and subsaline inland wetlands, led to much criticism of the Circular 39 or Martin system of classification and of the 1954 inventory itself. As no satisfactory alternative system for national classification exists, the first step toward a new national inventory was the development of a new classification system. Based on the advice of numerous experts throughout the country, this interim system was compiled. The classification has three primary objectives: (1) to group ecologically similar habitats; (2) to furnish habitat units for inventory and mapping; and (3) to provide uniformity in concepts and terminology throughout the U. S. The classification structure is hierarchical progressing from provinces, to ecological systems and subsystems, to habitat classes, subclasses, and orders, and finally to habitat type, a modification of the order for water regime and chemistry. This classification structure is explained in great detail textually and numerous diagrams and tables are included to illustrate its operation. In addition the correlation between the new system, Circular 39, and the other common regional and Canadian systems is demonstrated. (Moorhouse-Florida)
W77-05049

AREAWIDE PLANNING UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972: INTERGOVERNMENTAL AND LAND USE IMPLICATIONS,
For primary bibliographic entry see Field 5G.
W77-05050

ENVIRONMENTAL LAW: FWPCAA INTERPRETED TO SUBJECT DREDGING OPERATION OF CORPS OF ENGINEERS TO STATE PERMIT PROGRAMS.
For primary bibliographic entry see Field 5G.
W77-05051

DEVELOPMENTS IN WATER QUALITY AND LAND USE PLANNING: PROBLEMS IN THE APPLICATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
For primary bibliographic entry see Field 5G.
W77-05052

SELECTED ENVIRONMENTAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
For primary bibliographic entry see Field 6E.
W77-05054

LEGISLATIVE DEVELOPMENTS--DEEP-WATER PORT ACT OF 1974,
For primary bibliographic entry see Field 6E.
W77-05056

DROUGHT RESISTANCE OF LARCH SPECIES INTRODUCED TO THE CENTRAL FOREST-STEPPE REGION, (IN RUSSIAN),
Central Research Inst. of Forestry, Genetics and Plant Breeding, Voronezh (USSR).
A. V. Lukin.
Fiziol Rast. 21(5), p 1079-1082, 1974.

Descriptors: *Drought resistance, Forests, *Forest management.
Identifiers: *Larch species, Larix-decidua, Larix-gmelinii, Larix-leptolepis, Larix-polonica, Larix-sibirica, Larix-sukaczewii, *USSR.

The drought resistance of larch species introduced to the Forest-Steppe Experimental Breeding Station (near Lipetsk) (USSR) was studied in 1972. The species originating from the Soviet Far East and East Asia, Larix gmelinii and L. leptolepis, suffered most. L. decidua, L. polonica, L. sibirica and L. sukaczewii manifested the highest drought resistance. These species are recommended for man planting under the conditions of the Central Forest-Steppe region.--Copyright 1975, Biological Abstracts, Inc.
W77-05098

4B. Groundwater Management

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE I,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W77-04602

INFILTRATION OF WATER ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5B.
W77-04626

POLLUTED GROUNDWATER: A REVIEW OF THE SIGNIFICANT LITERATURE,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04631

LAND APPLICATION OF WASTEWATER: THE FATE OF VIRUSES, BACTERIA AND HEAVY METALS AT A RAPID INFILTRATION SITE,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
For primary bibliographic entry see Field 5D.
W77-04647

HYDROMINERAL DEPOSITS AT VOLVIC, (IN FRENCH),
For primary bibliographic entry see Field 2K.
W77-04656

SUBSURFACE APPLICATION SOLVES COMMUNITY'S SLUDGE DISPOSAL PROBLEM.
For primary bibliographic entry see Field 5D.
W77-04707

SURVIVAL OF COLIFORM BACTERIA IN SEWAGE SLUDGE APPLIED TO A FOREST

CLEARCUT AND POTENTIAL MOVEMENT INTO GROUND WATER,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-04723

GROUNDWATER POLLUTION FROM A SEPTIC TILE FIELD,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04728

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, Mich. Hiawatha National Forest.
For primary bibliographic entry see Field 5B.
W77-04756

PREDICTION OF FUTURE NITRATE CONCENTRATIONS IN GROUND WATER,
Water Research Centre, Marlow (England). Medmenham Lab.
For primary bibliographic entry see Field 5B.
W77-04757

THE CONTRIBUTION OF FERTILIZER TO THE GROUND WATER OF LONG ISLAND,
Suffolk County Dept. of Environmental Control, Hauppauge, N. Y. Fresh Water Resources Section.
For primary bibliographic entry see Field 5B.
W77-04758

DESIGN AND OPTIMIZATION OF GROUNDWATER MONITORING NETWORKS FOR POLLUTION STUDIES,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5A.
W77-04759

MONITORING CYCLIC FLUCTUATIONS IN GROUND-WATER QUALITY,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 5B.
W77-04760

SUMMARY, PHASE 1 - ARIZONA STATE WATER PLAN: INVENTORY OF RESOURCE AND USES.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W77-04782

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART C, LITTLE ARKANSAS RIVER BASIN,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6B.
W77-04851

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN CROSBY COUNTY, TEXAS,
Texas Water Development Board, Austin.
A. W. Wyatt, A. E. Bell, and S. Morrison.
Report No. 209, September 1976. 69 p. 24 maps, 18 tab., 65 ref.

Descriptors: *Aquifers, *Groundwater, *Water supply, *Projections, Aquifer characteristics, Water storage, Pumping, Water wells, *Texas, *Recharge, Irrigation water, Water utilization, Overdraft, Groundwater reservoirs, Natural recharge, Groundwater resources, Groundwater basins.

Identifiers: *Ogallala aquifer(Texas), Well yields, Crosby County(Texas).

In Crosby County, Texas, groundwater in the Ogallala aquifer declining at ten times the natural recharge rate prompted a study to estimate the volume of water in storage, to project depletion of this water by decades through 2020, and to persuade local users of the water to institute timely conservation measures. The report contains estimates of pumpage, pumping lifts, and other data related to current and future municipal and agricultural water use in the county. No attempt is made, however, to project the amount of water in underground storage which may ultimately be recoverable. Geological characteristics, storage properties, saturated thickness, volume of water in storage, and recharge and irrigation return flows are summarized. Illustrations guide landowners and water users as to: (1) how much water is in storage under any given tract of land; (2) what can happen to well yields if the saturated thickness diminishes; (3) estimates of current pumping lifts and what they are expected to be in the future with increased energy costs; and (4) the results of all-out conservation efforts. Projections are based on the hydrologic data, the depletion of saturated thickness, calculated volume of water in storage, calculated pumpage and pumping lifts, and well-yield estimates. (Auen-Wisconsin)
W77-04866

ORGANIC LEACHATE THREATENS GROUNDWATER QUALITY,
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5B.
W77-04870

OPTIMAL PUMPING REGIMES IN AN UNCONFINED COASTAL AQUIFER,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown.
Journal of Hydrology, Vol 31, No 3/4, p 271-280, December 1976. 4 fig, 1 tab, 2 ref, 1 append.

Descriptors: *Pumping, *Coasts, *Water table aquifers, *Mathematical models, *Water management(Applied), Water wells, Groundwater resources, Water resources development, Storage capacity, Equations, Aquifer characteristics, Saline water intrusion.
Identifiers: Cyclic storage.

Simple analytical models, containing a manageable number of parameters, can be set up to describe the decline in groundwater storage associated with increasing development of an unconfined aquifer. In the case of a coastal aquifer at a higher level of development, abstraction (especially durin the summer period) must increaseingly take place at sites remote from the coast. Such sites are termed storage sites, and their use avoids the problems of saline encroachment. The precise way in which, at least under annually cyclic conditions, the abstraction must be moved away from sites close to the coastal margins (termed leakage sites) as optimum development approaches can also be investigated using such models. (Visocky-ISWS)
W77-04873

THE EFFECT OF VERTICAL SAND DRAINS ON THE HYDRAULIC RESISTANCE OF A SEMI-PERVIOUS LAYER,
International Water Supply Consultants, Rotterdam (Netherlands).
For primary bibliographic entry see Field 8D.
W77-04877

QUANTITATIVE EVALUATION OF A METHOD FOR ESTIMATING RECHARGE TO THE DESERT BASINS OF NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 2F.
W77-04878

A NUMERICAL STUDY OF CONFINED-UNCONFINED AQUIFERS INCLUDING EFFECTS OF DELAYED YIELD AND LEAKAGE,
Kansas State Geological Survey, Lawrence.
For primary bibliographic entry see Field 2F.
W77-04882

INJECTION/EXTRACTION WELL SYSTEM--A UNIQUE SEAWATER BARRIER,
Brown and Caldwell, Pasadena, Calif.
N. T. Sheahan.
Ground Water, Vol. 15, No. 1, p 32-50, January-February 1977. 12 fig, 10 ref.

Descriptors: *Saline water intrusion, *Injection wells, *Groundwater barriers, *California, Wells, Water wells, Groundwater recharge, Aquifers, Sea water, Salinity, Irrigation, Waste water disposal, Artificial recharge, Groundwater, Hydrology.
Identifiers: *Palo Alto(Calif), *San Francisco Bay(Calif).

A multiple-aquifer system in the bayfront area of Palo Alto, California, is being intruded with seawater from San Francisco Bay. In order to combat this potential degradation of the groundwater supplies in the area, a sea water intursion barrier is being constructed, consisting of a series of injection wells used to inject 2.0 million gallons per day (7.6 million liters per day) of reclaimed wastewater into a shallow aquifer. The injected water is subsequently removed by a similar system of extraction wells to avoid any possible degradation of the water supply aquifers from this source and to allow reuse of the reclaimed wastewater. The investigation phase included test drilling, aquifer testing, and injection testing to determine the feasibility of the injection/extraction (I/E) concept. The number, spacing, and location of I/E doublets were optimized by using a digital computer model. The double-cased, double-screened wells were constructed, using corrosion-resistant materials, and the wells were designed for ease of routine maintenance. In operation, injection and extraction will be computer controlled by sensing piezometric levels in a series of monitor wells. Water pumped from the extraction wells will be sold for industrial and agricultural purposes. The I/E well system has been approved for Federal and State grand funding. (Sims-ISWS)
W77-04888

IMPROVING THE SANITARY PROTECTION OF GROUND WATER IN SEVERELY FOLDED, FRACTURED, AND CREVICED LIMESTONE,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5B.
W77-04890

LAND AND WATER USE IMPACTS ON GROUND-WATER QUALITY IN LAS VEGAS VALLEY,
Office of Radiation Programs. Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W77-04891

MAPS SHOWING GROUND-WATER CONDITIONS IN THE CONCHO, ST. JOHNS, AND WHITE MOUNTAINS AREAS, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04971

WATER USE IN MISSISSIPPI, 1975,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04972

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W77-04975

SALINE WATER IN THE LITTLE ARKANSAS RIVER BASIN AREA, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-04979

WATER LEVELS IN ARTESIAN AND NONARTESIAN AQUIFERS OF FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla. Water Resources Div.
H. G. Healy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 471, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 76-101, October 1976. 115 p, 54 fig, 1 tab.

Descriptors: *Florida, *Groundwater, *Water level fluctuations, *Aquifers, *Observation wells, Hydrographs, Hydrologic data.

Based on measurements of water level in 675 wells selected from a network of about 1,300 observation wells, ground-water levels during May 1973 - May 1974 declined from 2 to 4 feet in the Floridan aquifer through most of north and central peninsular Florida. Hydrographs of 55 wells show the downward trends of ground-water levels continued in several areas of heavy pumping, the most notable area being in west-central Polk County where declines ranged from 18 to nearly 28 feet. In northwest Florida, declines ranged from less than 1 foot to 2 feet in the sand-and-gravel aquifer. In the southeastern coastal part of the State, levels rose 1 to 2 feet. (Woodard-USGS)
W77-04985

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY, CALIFORNIA,
Geological Survey, Sacramento, Calif. Water Resources Div.
J. F. Poland.
In: Land Subsidence in California; Second International Symposium on Land Subsidence, held in Anaheim, California, A-1 - A-9, December 1976. 6 fig, 6 ref.

Descriptors: *Land subsidence, *Compaction, *Groundwater, *Withdrawal, *Aquifers, Aquitards, *California, Groundwater recharge, Imported water.
Identifiers: *Santa Clara Valley(Calif).

In California, withdrawal of ground water from the Santa Clara Valley (North) increased nearly fourfold from 1915-20 to 1960-65, to 228 million cubic meters. The artesian head which, in 1915, was at or above land surface from San Francisco Bay to San Jose, declined about 58 m by 1966. Periodic releveling of bench marks shows that land subsidence began about 1918; by 1969, downtown San Jose had settled 4 m, and marsh lands near the Bay had sunk as much as 2.4 m. The subsidence created major problems in levee construction to restrain Bay waters and in repair of well casings ruptured by compaction. The local ground-water supply has been augmented by salvage of flood waters from local streams and by water importation. Surface-water imports to Santa Clara County increased from 37 million cubic meters in 1964-65 to 183 million cubic pumping, the artesian head in an index well recovered 31 m from 1967 to 1975.

Records of compaction of the confined-aquifer system have been obtained from two deep extensometers since 1961. In San Jose, the rate of compaction decreased from 30 cm per year in 1961 to 0.3 cm in 1973, proving that subsidence at that site had been stopped by the artesian-head recovery. (Woodard-USGS)
W77-04992

LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Sacramento, Calif. Water Resources Div.
B. E. Lofgren.
In: Land Subsidence in California; Second International Symposium on Land Subsidence held in Anaheim, California, G-1 - G-20, H1 - H2, December 1976. 15 fig, 21 ref.

Descriptors: *Land subsidence, *Compaction, *Aquifers, *Withdrawal, *California, Groundwater, Oil, Aquitards, Geologic mapping, Irrigation, Groundwater recharge, Imported water.
Identifiers: *San Joaquin Valley(Calif).

Four types of man-induced subsidence occur in San Joaquin Valley, Calif. In decending order of areal extent these causes are: (1) ground-water overdraft, (2) hydrocompaction, (3) oxidation of organic soils, and (4) oil- and gas-field withdrawal. Roughly half the entire valley, representing 13,500 sq km of productive farmland, has subsided due to ground-water pumping. Maximum subsidence exceeds 8.84 m. Widespread pumping from 40,000 irrigation wells, equaling one-quarter of all ground water pumped for irrigation in the country, caused this subsidence. Large imports of surface water from three major aqueducts have reduced the pumping. Subsidence has stopped in much of the valley. About 650 sq km of irrigable land is affected by hydrocompaction, and subsidence ranges from 1-5 m. Up to 0.6 m of subsidence measured over oil and gas fields in the ranges from 1-5 m. Up to 0.6 m of subsidence measured over oil and gas fields in the southern part of the valley is due to fluid withdrawals; however, the production of most of the fields was waning before leveling controls were established to measure subsidence. (Woodard-USGS)
W77-04993

NITROGEN AND METAL CONTAMINATION OF NATURAL WATERS FROM SEWAGE SLUDGE DISPOSAL ON LAND,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-05002

METHODOLOGY AND CRITERIA FOR SITING ENERGY PLANTS IN IDAHO,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W77-05006

GROUND-WATER MODELS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W77-05012

FLORIDA WATER AND RELATED LAND RESOURCES KISSIMMEE--EVERGLADES AREA,
Florida Dept. of Natural Resources, Tallahassee.
H. Shields.
1974. 180 p, 64 fig, 51 tab.

Descriptors: *Florida, *Water table aquifers, *Groundwater, *Watersheds(Basins), *Hydrology, Aquifers, Water supply, Water table, Zone of saturation, Water levels, Recharge, Natural recharge, Surfaces, Groundwater basins, Groundwater availability, Water sources, Water storage, Surface water availability, Water distribution(Applied), Water utilization, Aquifer characteristics, Large watersheds, Water law, Water policy, Drainage programs, Flood control.
Identifiers: *Kissimmee-Everglades Area(Fla).

Information is provided on the Kissimmee-Everglades region, its ground water hydrology, surface water resources, water use, and water-related projects. The area is bounded by the Highlands Ridge on the northwest, the Atlantic Coast Ridge on the east, and the Coastal Marsh on the south. Groundwater is an abundant resource in the area as both artesian and non-artesian aquifers, consisting of numerous water bearing formations, underlie the regions. The Floridan aquifer is the principal source of groundwater in the north while the highly permeable Biscayne aquifer serves the lower east coast. Groundwater supplies in each of the area's five watersheds are examined on a county by county basis. Abundant rainfall yields vast quantities of fresh surface water which is stored in Lake Okeechobee, numerous lakes in the Kissimmee River Basin, and in the Conservation Areas. A water budget investigation of surface water in each watershed is reported showing all water entering, stored in, and leaving each area in a set time period. A quantitative study of present and projected water use is included. A survey of all federal, state and local water related projects is provided. Extensive use of diagrams, graphs, and tables is made throughout the study and bibliographies are included following each section. (Moorhouse-Florida)
W77-05048

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF AGRICULTURAL LAND USES ON RUNOFF QUALITY.
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W77-04612

EVAPOTRANSPIRATION--SOME GROWTH AREAS,
Griffith Univ., Nathan (Australia). School of Australian Environmental Studies.
For primary bibliographic entry see Field 2D.
W77-04777

CHANGES IN THE WATER BALANCE WITH LAND MODIFICATION IN SOUTHERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
F. X. Dunin.
In: Watershed Management on Range and Forest Lands Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975, p 157-163, March 1976. 1 fig, 3 tab, 36 ref.

Descriptors: *Water balance, *Land management, *Erosion, *Soil-water-plant relationships, *Australia, *Land clearing, *Watershed management, Irrigation effects, Saline water intrusion, Overland flow, Soil water, Soil erosion, Damages, *Land use.

Hydrologic disturbance due to land modification in southern Australia, especially in agricultural, mountainous and forested catchments, is studied and interpreted. Loss of topsoil caused reduction of agricultural productivity. Irrigation practices increased slinity of the Murray River, Australia's largest, and resulted in major water supply problems in downstream areas. Consequent salinization of nonirrigated land has been especially damaging to agricultural production in western Australia. The most significant hydrologic effects were due to removal of trees in combination with grazing. Damage has been most pronounced in semi-arid to sub-humid environments, where degeneration has involved both erosion and salting. Early grazing management in arid regions changed overland water flow patterns and thereby, plant communities. In areas of low soil fertility and erratic rainfall, landscape was changed by sequential development of bared areas, soil detachment and crusting, followed by reduced infiltraton and increased overland flow. Problems in mountain regions with regular winter snowfall and in rainfed forested areas are discussed. (Jahns-Arizona)
W77-04779

LAND SURFACE MODIFICATIONS AND THEIR EFFECTS ON RANGE AND FOREST WATERSHEDS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 4D.
W77-04780

TABLES OF GEOMETRY FOR LOW-STANDARD ROADS FOR WATERSHED MANAGEMENT CONSIDERATIONS, SLOPE STAKING, AND END AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-04831

THE MANAGEMENT OF URBAN COASTAL RESOURCES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 6B.
W77-04845

LAKE ONTARIO ATLAS: LAND USE,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W77-04846

LAND AND WATER USE IMPACTS ON GROUND-WATER QUALITY IN LAS VEGAS VALLEY,
Office of Radiation Programs. Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W77-04891

EFFECTS OF ENERGY-RELATED ACTIVITIES ON THE ATLANTIC CONTINENTAL SHELF,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 6G.
W77-04934

EFFECTS OF OFF-ROAD VEHICLE USE ON THE HYDROLOGY AND LANDSCAPE OF ARID ENVIRONMENTS IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
C. T. Snyder, D. G. Frickel, R. F. Hadley, and R. F. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 520, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-99, September 1976. 45 p, 11 fig, 5 tab, 6 ref.

Descriptors: *Accelerated erosion, *Land use, *Recreation, *Erosion rates, Rainfall, Runoff, Sediment yield, Environmental effects, Revegetation, California.
Identifiers: *Motorcycle hill-climbing.

Two widely separated sites in California used for motorcycle hill-climbing were studied to evaluate the impact on the landscape and hydrology. At Panoche Hills in central California, an area formerly used by motorcycles together with an adjacent unused area were monitored from 1971 to 1975. Observations in both areas included measurements of precipitation, runoff, soil moisture, soil bulk density, plant cover, and erosion surveys. At Dove Spring Canyon in souther California erosion was measured on a site that is currently being used for motorcycle hill-climbing. At the Panoche Hills site, the area used by motorcycles produced about eight times as nuch runoff as the unused area. Similarly, sediment yield from the used areas was 857 cubic meters/sq km, while the quantity of sediment from the unused area was not measurable by standard methods. At the Dove Spring Canyon site, which is still being used for hill-climbing, erosion surveys show that degradation in trails has been as much as 0.3 m in the period 1973-75. Compaction of soils and reduction of permeability appears to be the most serious hydrologic impact of motorcycle use at Panoche Hills. Increased bulk density of soils reduces depth of moisture penetration which deprives plants of moisture needed for growth. (Woodard-USGS)
W77-04980

SEDIMENT-CONTROL METHODS IN URBAN DEVELOPMENT: SOME EXAMPLES AND IMPLICATIONS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-04982

4D. Watershed Protection

WHY SIMULATION,
For primary bibliographic entry see Field 2E.
W77-04725

PERCOLATION AND STREAMFLOW IN RANGE AND FOREST LANDS,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz.
For primary bibliographic entry see Field 2G.
W77-04775

SOIL WATER MOVEMENT: INFILTRATION, REDISTRIBUTION, AND GROUNDWATER MOVEMENT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 2G.
W77-04776

EVAPOTRANSPIRATION--SOME GROWTH AREAS,
Griffith Univ., Nathan (Australia). School of Australian Environmental Studies.
For primary bibliographic entry see Field 2D.
W77-04777

CHANGES IN THE WATER BALANCE WITH LAND MODIFICATION IN SOUTHERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 4C.
W77-04779

LAND SURFACE MODIFICATIONS AND THEIR EFFECTS ON RANGE AND FOREST WATERSHEDS,
Agricultural Research Service, Sidney, Mont.
J. R. Wight.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975, p 165-174, March 1976. 4 fig, 54 ref.

Descriptors: *Water yield improvement, *Erosion control, *Watershed management, *Range management, *Forest watersheds, Rainfall-runoff relationships, Surface runoff, Snowmelt, Soil water, Terracing, Contour farming, *Montana, Fertilization, Land reclamation, Chiselling.
Identifiers: Level bench terracing, Gully plugs, Pitting.

Land surface modifications can reduce runoff and erosion and increase soil water and subsequent forage production, especially on arid and semiarid rangelands. Such treatments usually cause impoundment or retention of rainfall and snowmelt, with an increased soil permeability when treatment is mechanical. Reduced surface runoff allows more precipitation to enter the soil, increasing evapotranspiration and sometimes groundwater supplies. Modification treatments discussed include level bench terracing, contour furrowing, pitting, use of gully plugs, ripping and chiselling and contour trenching. Level bench terracing is a severe and expensive modification of rangeland using long, flat terraces diked at the ends and front to provide water storage capacity. Contour furrowing provides rainfall and snowmelt runoff retention, improved infiltration and snowtrapping; other benefits are described. Pitting is simple to apply, with benefits similar to those of contour furrowing. Fertilization may be used with such treatments to take advantage of greater soil water and to increase water extraction by stimulating root growth. Also discussed are the uses of modification treatments with respect to land reclamation problems in Montana. (Jahns-Arizona)
W77-04780

TABLES OF GEOMETRY FOR LOW-STANDARD ROADS FOR WATERSHED MANAGEMENT CONSIDERATIONS, SLOPE STAKING, AND END AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan.
General Technical Report INT-32, October, 1976. 104 p, 4 fig, 10 ref, append.

Descriptors: *Road construction, *Erosion control, *Watershed management, Road design, Erosion, Sedimentation, Soil conservation, Engineering.

Tables were developed to provide various dimensions for low-standard roads built with a balanced construction technique. The information is intended to provide a means of evaluating potential watershed impacts of road construction and of helping to plan for appropriate corrective actions. Additional dimensions are provided to assist in slope staking and for estimating excavation volumes. The information has application in both the road location and design phases of the road construction process. The tables are for use in situations where low road costs preclude detailed engineering design or where engineering talents are unavailable. (Witt-IPC)
W77-04831

CLASSIFICATION OF NESTED TRIBUTARY BASINS IN ANALYSIS OF DRAINAGE BASIN SHAPE,
State Univ. of New York at Buffalo. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-04880

EFFECTS OF OFF-ROAD VEHICLE USE ON THE HYDROLOGY AND LANDSCAPE OF ARID ENVIRONMENTS IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-04980

SEDIMENT-CONTROL METHODS IN URBAN DEVELOPMENT: SOME EXAMPLES AND IMPLICATIONS,
Geological Survey, Reston, Va. Water Resources Div.
H. P. Guy.
Geological Society of America Special Paper 174, p 21-35, 1976. 9 fig, 1 tab, 10 ref.

Descriptors: *Sediment control, *Urbanization, *Erosion, *Land use, *Watershed management, Methodology, Evaluation, Sediment transport, Vegetation.
Identifiers: Sediment-detention basins, Straw bales.

Sediment-control methods in areas of urban development must be more carefully designed temporally and spacially than methods used in rural areas. Several jurisdictions have adopted a manual for sediment-control methods that is based largely on rural sediment-control technology. The applications of those general methods too often have adverse geomorphic implications when large quantities of sediment suddenly move into and through natural streams. An example of adverse effects of attempted sediment control is the use of small sediment-detention basins downstream from a development project when the construction phase will last for only a few months. The result is that (1) damage is done to the waterway during installation, maintenance, and, if necessary, removal of the structure; (2) little of the fine sediment is trapped and considerable coarse sediment may be lost during a storm of long recurrence interval; (3) maintenance may be neglected by the contractor, which can cause a failure of the system; and (4) the cost of the detention is passed on to the customer. The need for such a detention basin might be avoided by designing the facility so as to insure minimum disturbance of the landscape, a reduction in direct overland flow, and better timing of construction to minimize soil exposure during the rainy season. (Woodard-USGS)
W77-04982

RELATION OF EROSION TO SEDIMENT YIELD,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04986

SEDIMENT PROBLEMS AND PLANNING IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04989

A SUBALPINE SNOWMELT RUNOFF MODEL,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2A.
W77-05000

FLORIDA WATER AND RELATED LAND RESOURCES KISSIMMEE--EVERGLADES AREA,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4B.
W77-05048

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CONFINED ANIMALS AND PUBLIC ENVIRONMENT,
Agricultural Extension Service, Stillwater, Okla.
Feedlot Waste Management.
For primary bibliographic entry see Field 5B.
W77-04617

INFILTRATION ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5B.
W77-04625

INFILTRATION OF WATER ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 5B.
W77-04626

METHODOLOGY FOR THE STUDY OF URBAN STORM GENERATED POLLUTION AND CONTROL,
Envirex, Inc., Milwaukee, Wis. Environmental Science Div.
For primary bibliographic entry see Field 5D.
W77-04640

OVERLAND FLOW TREATMENT OF RAW WASTEWATER WITH ENHANCED PHOSPHORUS REMOVAL,
Robert S. Kerr Environmental Research lab., Ada, Okla.
For primary bibliographic entry see Field 5D.
W77-04641

DETERMINATION OF RADIUM REMOVAL EFFICIENCIES IN IOWA WATER SUPPLY TREATMENT PROCESSES,
Iowa Dept. of Environmental Quality, Des Moines.
For primary bibliographic entry see Field 5F.
W77-04652

BIOLOGICAL PURIFICATION OF URBAN WASTEWATERS BY MEANS OF ROTATING BIOLOGICAL DISKS (EPURATION BIOLOGIQUE DES EAUX USEES URBAINES AU MOYEN DE DISQUES BIOLOGIQUES TOURNANTS),
For primary bibliographic entry see Field 5D.
W77-04685

FECAL COLIFORM AND FECAL STREPTOCOCCUS DENSITY RELATIONSHIPS IN WASTE DISCHARGES AND RECEIVING WATERS,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5B.
W77-04711

CHARACTERIZATION OF SEPTIC TANK EFFLUENT-A STATISTICAL ANALYSIS,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
T. Viraraghavan.
Journal of the Institution of Engineers (India), Vol 56, No 3, p 115-117, June, 1976. 2 fig, 2 tab, 4 ref.

Descriptors: *Pollutant identification, *Waste water treatment, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, Chemical oxygen demand, Treatment facilities, *Septic tanks, *Effluents.

An analysis of twenty samples of septic tank effluent from a residence near Ottawa was used to determine its chemical and bacteriological characteristics. Observations indicated that effluent pH was 7.0 or less during 64% of the time. There was a smaller range of pH variance in the effluent than with raw sewage, probably contributable to hydraulic scouring and/or sludge gasification causing quantities of sedimented material to re-enter the effluent stream. Ratios were determined for BOD/COD (0.49), COD/SOC (7.8), and BOD/SOC (3.8). Mean phosphate levels were lower than in raw sewage, though occasionally higher. Anaerobic reactions in the septic tank caused ammonia nitrogen increases and nitrate nitrogen decreases when compared to raw sewage. Mean fecal coliforms were about 8% of mean total coliforms. Mean ratio values of fecal coliforms/fecal streptococci were 1.59, near that of raw sewage. Levels of Pseudomonas aeruginosa were less than in raw sewage. (Collins-FIRL)
W77-04714

BOD AS POLLUTIONAL PARAMETER,
Delhi Coll. of Engineering (India).
H. S. Bhatia.
Journal of the Institution of Engineers (India), Vol. 56, No. 3, p 87-89, June, 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Biochemical oxygen demand, *Testing procedures, *Control, Incubation, Time, Waste water treatment, *Bioindicators.

The limitations of standard BOD tests and alternatives for them were discussed. Limitations of the standard tests include: the complexity of testing more than once daily, the lack of effective process control due to the 5-day incubation period, the nonquantitative quality of the 5-day test without approximation of the ratio of 5-day to ultimate oxygen demand, the inherent deviation in BOD results, and the inaccurate determination of biological treatment processes by a 5-day analysis. Alternative approaches may be oxygen based, carbon based, or nitrogen based. The first considers most standard test limitations. Manometric techniques give a more adequate reservoir of oxygen and eliminate the necessity of high dilutions. With polarographic methods, dissolved oxygen can be measured in less than 10 minutes. Impurities are oxidized by oxygen gas. The carbon based tests measure catalytic conversion of organic carbon in the waste by a non-dispersive infrared analyzer. No presently available organic chemical can resist this oxidation. BOC/total organic carbon (TOC) ratios are based on the theoretical ratio of BOD5 to TOC. Low ratios in secondary effluent indicate a large number of organics resistant to further biochemical oxidation in the final effluent. Nitrogen based tests are still undergoing investigation. The major deterrent to the use of these new methods is the complexity of equipment and procedures. (Collins-FIRL)
W77-04715

EXAMINATION OF SEWAGE SLUDGE WITH SPECIAL REGARD TO PARTICLE SIZE DISTRIBUTION (KLAERSCHLAMMUNTERSUCHUNG UNTER BESONDERER BERUECKSICHTIGUNG DER TEILCHENGROESSENVERTEILUNG),
R. Leschber, and W. Haacke.
Vom Wasser, Vol. 45, p 305-325, 1975. 10 fig, 9 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Sewage sludge, *Particle size, *Waste treatment, Sewerage, Sludge treatment, Flocculation.

Characterizing sewage sludges was studied. A method of determining sewage sludge particle size distribution has been developed that permits differentiation from 4 to 4000 microns and may be used with other characteristics to characterize sewage sludges in cases of defined treatment methods. The method has been tested using untreated sewage sludges with different origins and sludges treated using varying concentrations of flocculants. It has been proposed as an international provisional standard method. (Snyder-FIRL)
W77-04716

A SIMPLE TUBE-TYPE WATER PROFILE SAMPLER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. G. Gilbert, and J. B. Miller.
Water Resources Research, Vol. 12, No. 4, p 812-815, August, 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Pollutant identification, *Water sampling, *Profiles, *Design, *Ponds, Tubes, Dissolved oxygen, Oxygen.

Plexiglass tube-type water samplers were designed and constructed for use in small ponds. It is a plexiglass tube with holes drilled at intervals corresponding to water layers to be sampled. To obtain a water sample, the tube, open at both ends and with the side ports closed, was lowered vertically into the water. With the top stoppered, the tube was raised and its lower end stoppered just under the water surface. While the tube is held vertically, the water profile samples are obtained after removing the top stopper and successively collecting from top to bottom the water sample from each side port. Dissolved oxygen (DO) profiles of two ponds collected with the tube sampler were compared with those measured with an oxygen probe directly in the ponds and with a Van Dorn water sampler. Chemical and biological analyses of water samples obtained with the tube-type sampler and Kemmerer and Van Dorn water samplers were also compared. Dissolved oxygen profiles measured by all three methods were similar. Similar relative results were obtained from water samples collected with all three samplers, but the tube-type sampler was more desirable for obtaining water profile samples because of its simplicity of design and operation. (Snyder-FIRL)
W77-04717

4-AMINOBIPHENYL, 2- NAPHTHYLAMINE, AND ANALOGS: ANALYTICAL PROPERTIES AND TRACE ANALYSIS IN FIVE SUBSTRATES,
National Center for Toxicological Research. Jefferson, Ark.
C. L. Holder, J. R. King, and M. C. Bowman.
Journal of Toxicology and Environmental Health, Vol. 2, No. 1, p 111-129, September, 1976. 5 fig, 10 tab, 14 ref.

Descriptors: *Pollutant identification, *Trace elements, Analysis, *Monitoring, *Salts, Water pollution, *Analytical techniques, Spectrophotometry, Organic compounds.
Identifiers: Carcinogens, *Aminobiphenyls, *Naphthylamines, Benzene.

Monitoring methods were describes for trace levels of 4-aminobiphenyl, 2-naphthylamine, and their hydrochloride salts in waste water, microbiological growth media, potable water, human urine, and mouse blood. Spectrophotofluorometry (SPF) was used. One hundred milliliters of waste water was added to a 160 milliliter culture with 2 grams of NaCl, made alkaline, shaken for 2 minutes, centrifuged for 10 minutes, cleaned up, and prepared for analysis. Benzene was used for extraction. For recovery experiments, waste water was spiked at 0 and 20 ppb through the addition of milliliter of methanol (or water) with the appropriate amount of compound,

held at 5 C overnight, and analyzed. Recoveries averaged 89% with good precision, and the background of unspiked samples was 0.2-0.3 ppb. The method was successfully used to evaluate laboratory-scale adsorber system performance. Average recoveries were 95% (4-aminobiphenyl), 90% (4-aminobiphenyl HCl), 90% 2-naphthylamine), and 80% (2-naphthylamine HCl). (Collins-FIRL)
W77-04718

DETERMINING STABILITY OF SLUDGE FROM AEROBIC DIGESTERS,
Lagnese and Associates, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W77-04719

DETECTION OF TRENDS IN WATER QUALITY DATA FROM RECORDS WITH DEPENDENT OBSERVATIONS,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier.
Water Resources Research, Vol. 12, No. 5, p 1037-1046, October 1976. 11 fig, 3 tab, 12 ref, 1 append. NSF BMS74-20744.

Descriptors: *Water quality, *Time series analysis, *Statistical methods, Analytical techniques, Statistics, Data processing, Monte Carlo method, Markov processes, Temperature, Water temperature, Suspended solids, Conductivity, Water pollution, Pollutants, Model studies.
Identifiers: *Water quality trend analysis.

Classical statistical tests for trend, both parametric and nonparametric, assume independence of observations, a condition rarely encountered in time series obtained by using moderate to high sample frequencies. A method was developed for summarizing the power of the parametric t tests, the nonparametric Spearman's rho test, and Mann-Whitney's test against step and linear trends in a dimensionless 'trend number' which is a function of trend magnitude, standard deviation of the time series, and sample size. For the case of dependent observations, use of an equivalent independent sample size rather than the actual sample size was shown to enable use of the same trend number developed for the independent case. An important related result is the existence of an upper limit on power (trend detectability) over a fixed time horizon, regardless of the number of samples taken, for a lag 1 Markov process. (Sims-ISWS)
W77-04753

PREDICTION OF FUTURE NITRATE CONCENTRATIONS IN GROUND WATER,
Water Research Centre, Marlow (England). Medmenham Lab.
For primary bibliographic entry see Field 5B.
W77-04757

DESIGN AND OPTIMIZATION OF GROUNDWATER MONITORING NETWORKS FOR POLLUTION STUDIES,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
H. O. Pfannkuch, and B. A. Labno.
Ground Water, Vol. 14, No. 6, p 455-462, November-December 1976. 6 fig, 2 tab, 5 ref.

Descriptors: *Network design, *Water pollution, *Groundwater, *Monitoring, Waste disposal, Waste dumps, Networks, Planning, Wells, Observation wells, Sampling, Leachate, Chemical analysis, Water pollution, Pollutants, Geology, Leaching, Aquifers, Hydrogeology.

The successful design and operation of a groundwater monitoring and surveillance system were based on a stepwide process of obtaining hydrogeologic information. Because of the inherent uncertainty and inhomogeneity of natural hydrogeological systems, the true monitoring network cannot be specified before some basic knowledge about system configuration and dynamics is known. Forethought, planning, and incorporation of design criteria as part of the initial phase of project management establishes the monitoring network strategy. Optimization of the monitoring network takes place through the completion of the following five phases: (1) preliminary network design and information gathering, (2) initial installation and testing, (3) completion and verification, (4) operational, and (5) project termination. Experience gained from monitoring the conditions at the University of Minnesota's chemical and special waste disposal site resulted in the design and optimization procedure. Concern for possible groundwater contamination led to analysis of surface and subsurface, physical and chemical conditions. Subsequently, a monitoring system was established to meet project objective. No degradation of the grundwater was found during the five-year study. (Sims-ISWS)
W77-04759

MONITORING CYCLIC FLUCTUATIONS IN GROUND-WATER QUALITY,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 5B.
W77-04760

THE ANALYSIS OF SULFATE ION IN SEAWATER BY DIFFERENCE CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W77-04767

DETERMINATION OF TRACE VANADIUM IN NATURAL WATERS BY A COMBINED ION EXCHANGE-CATALYTIC PHOTOMETRIC METHOD,
Yamanashi Univ., Kofu (Japan). Dept. of Applied Chemistry.
T. Fukasawa, and T. Yamane.
Analytica Chimica Acta, Vol. 88, No. 1, p 147-153, January, 1977. 1 fig, 9 ref, 1 tab.

Descriptors: *Water analysis, *Pollutant identification, *Photometry, *Ion exchange, *Metals, Analytical techniques, *Trace elements, Water pollution sources, Separation techniques, Water properties, Water chemistry, Surface waters, Rivers, Lakes, Anion exchange, Cation exchange.
Identifiers: *Vanadium.

A description if given of a sensitive, selective, and simple method for the determination of trace vanadium in natural waters. Vanadium is separated and concentrated by a combined cation- and anion-exchange procedure in 0.05 M HCl-0.1% hydrogen peroxide media, and determined by a catalytic method based on the oxidation of gallic acid by bromate. The proposed method is applicable to the analysis of natural waters. The relative standard deviations are 3.9% for 0.8 ppb of vanadium in river water and 3.2% for 1.9 ppb of vanadium in lake water (surface). As little as 0.03 ppb of vanadium can be determined in samples of 100 ml or less. (Witt-IPC)
W77-04796

EXTRACTION-PHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF NITRITE IN WATERS,
Okayama Univ. (Japan). Dept. of Chemistry.
K. Toei, and T. Kiyose.
Analytica Chimica Acta, Vol. 88, No. 1, p 125-129, January, 1977. 6 ref, 1 tab.

Descriptors: *Water analysis, *Nitrites, *Pollutant identification, *Spectrophotometry, Analytical techniques, *Trace elements, Water pollution sources, *Separation techniques, Water properties, Water chemistry, Hydrogen ion concentration, Surface waters, Rivers, Foreign countries.
Identifiers: *Japan, Okayama Prefecture(Japan).

Traces of nitrite in river water can be determined by extraction spectrophotometry. Nitrite in 100 ml of sample water at pH 1.5-3.0 diazotizes p-aminoacetophenone, which is then coupled with m-phenylenediamine at the same pH. The 2,4-diamino-4' -acetylazobenzene formed is extracted into 5 or 10 ml of toluene at pH 9 and the absorbance is measured at 450 nm. The ions normally present in river water do not interfere. The nitrite contents in river waters in Okayoma Prefecture, Janan, are 1-30 ppb. (Witt-IPC)
W77-04797

OPTIMIZATION OF A SIMPLE SPOTTING PROCEDURE FOR X-RAY FLUORESCENCE ANALYSIS OF WATERS,
Antwerp Univ., Wilrijk (Belgium). Dept. of Chemistry.
J. Smits, and R. Van Grieken.
Analytica Chimica Acta, Vol. 88, No. 1, p 97-107, January, 1977. 2 fig, 20 ref, 4 tab.

Descriptors: *Water analysis, *X-ray fluorescence, *Pollutant identification, Analytical techniques, Trace elements, Evaporation, Industrial water, Aqueous solutions.
Identifiers: *Sample preparation, Filter paper.

Several sample preparation methods for waters for energy-disersive x-ray fluorescence were examined, as well as the influenence of sample size on the analytical characteristics. The most satisfactory simple rapid method proved to be spotting of 1.5 ml of water sample on a Whatman-41 cellulose filter paper provided with a wax ring of 29 mm diameter and evaporating the water with an unheated air stream from underneath. Sensitivities are below 100 ppb for most elements and often below 50 ppb when the optimal secondary fluorescer is used. Accuracy and precision are usually in the 15-20% range. The method is applicable to many dilute equeous solutions, as is illustrated by analysis of industrial water samples and ashed biological material. (Witt-IPC)
W77-04798

LIQUID EXTRACTION FOR THE RAPID DETERMINATION OF HALOMETHANES IN WATER,
Energy Research and Development Administration, Ames, Iowa.
J. J. Richard, and G. A. Junk.
Journal American Water Works Association, Vol. 69, No. 1, p 62-64, January, 1977. 8 ref, 3 tab.

Descriptors: *Water analysis, *Pollutant idenfication, *Gas chromatography, *Halogens, *Methane, Analytical techniques, Trace elements, Water pollution sources, Separation techniques, Water properties, Water chemistry, Solvent extractions.
Identifiers: *Halocarbons, *Halomethanes.

A description is given of a rapid and simple method for the determination of halomethanes in water. The procedure involves vigorous shaking of water and pentane with subsequent gas chromatographic analysis of the pentane extract using an electron-capture detector. Less than 0.1 microgram/liter in a 10-ml water sample is easily detected. (Witt-IPC)
W77-04803

A RAPID AND SENSITIVE METHOD FOR DETERMINING VOLATILE ORGANOHALIDES IN WATER,
Monsanto Co., St. Louis, Mo.
J. P. Mieure.

Journal American Water Works Association, Vol. 69, No. 1, p 60-62, January, 1977. 1 fig, 5 ref, 1 tab.

Descriptors: *Water analysis, *Pollutant identification, *Gas chromatography, *Halogens, *Organic compounds, Analytical techniques, Trace elements, Water pollution sources, Separation techniques, Water properties, Water chemistry, Potable water, Natural streams, Waste water(Pollution), Solvent extractions, Methane.
Identifiers: *Halocarbons.

A method is presented which is suitable for determine volatile organohalides in drinking, natural, or waste waters. The method is based on extraction into an organic solvent followed by measurement by electron-capture gas chromatography. The lower detection limit for each organohalide component is less than 1 microgram/liter with a relative reproducibility of plus or minus 3. Routine samples can be monitored at a rate of 10-12 per hour. (Witt-IPC)
W77-04804

IDENTIFICATION AND DETERMINATION OF PHTHALATE ESTERS IN RIVER WATER BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY,
Mie Prefectural Univ., Tsu (Japan). Dept. of Industrial Chemistry.
S. Mori.
Journal of Chromatography, Vol. 129, p 53-60, December 22, 1976. 4 fig, 7 ref, 1 tab.

Descriptors: *Water analysis, *Pollutant identification, *Chromatography, Organic compounds, Analytical techniques, Trace elements, Water pollution sources, Water properties, Water chemistry, Surface waters, Rivers, Separation techniques.
Identifiers: *Phthalates.

The use of three separation modes (normal and reverse-phase adsorption chromatography and gel chromatography) with an ultraviolet absorption detector of variable wavelength provides the basis for a sensitive method for the determination of phthalate esters in river water. Phthalates in river water were extracted with n-hexane, and the extract was injected into three chromatographic systems: porous polymer beads-n-hexane (at 224 nm); porous polymer beads-methanol (at 224 nm); and polystyrene GPC gel-chloroform (at 243 nm), without any pretreatment such as cleanup or concentration. Average concentrations of approximately 45 ppb of di-n-butyl phthalate and 10 ppb of di-2-ethylhexyl phthalate (DOP) were found in a given river water. Phthalate concentrations as low as 2 ppb could be determined. The limit of determination could be lowered by the use of a concentration process. The absolute detection limit was 2 ng of DOP at 224 nm. (Witt-IPC)
W77-04805

GAS CHROMATOGRAPHY-MASS SPECTROMETRY OF CHLOROPHENOLS IN SPENT BLEACH LIQUORS,
Swedish Forest Products Research Lab., Stockholm.
K. Lindstrom, and J. Nordin.
Journal of Chromatography, Vol. 128, No. 1, p 13-26, November 17, 1976. 6 fig, 7 ref, 3 tab.

Descriptors: *Bleaching wastes, *Gas chromatography, *Mass spectrometry, Wastes, Industrial wastes, Water pollution sources, Analytical techniques, Pollutant identification, Chemical analysis, *Phenols, Pollutants, Pulp wastes, Pulp and paper industry, Effluents, Chromatography.
Identifiers: *Chlorophenols, Kraft mills.

Spent bleach liquors from the bleach plants of some kraft pulp mills were investigated for their content of chlorophenols. The chlorophenols are determined as their ethyl derivatives by means of gas chromatography-mass spectrometry after extraction, fractionation, and purification. Separation of the various components is performed by means of open-tube glass columns connected to either a flame ionization detector or an electron capture detector. (Witt-IPC)
W77-04806

FRACTIONATION BY MOLECULAR WEIGHT OF ORGANIC SUBSTANCES IN GEORGIA COASTAL WATER,
Georgia Univ., Sapelo Island. Marine Inst.
J. R. Wheeler.
Limnology and Oceanography, Vol. 21, No. 6, p 846-852, November, 1976. 7 fig, 12 ref, 1 tab.

Descriptors: *Sea water, *Organic compounds, *Georgia, *Water analysis, *Pollutant identification, *Membrane processes, Marshes, Carbohydrates, Carbon, Color, Water pollution sources, Reverse osmosis, Separation techniques, Water quality, Southeast U.S., Coasts, Salt marshes, Coastal marshes.
Identifiers: Molecular weight, *Ultrafiltration membranes.

Ultrafiltration membranes were used to separate organic substances in Georgai coastal water into fractions to which approximate molecular weight (MW) ranges could be assigned. Salt marsh water contained high concentrations of dissolved organic carbon between 1,000 and 30,000 MW, as well as high concentrations of dissolved carbohydrate in all MW classes. Concentrations of dissolved carbohydrate in offshore waters were low, and in some MW fractions (especially those above 30,000 MW) carbohydrate was at times undetectable. Absorbances at 254 nm by MW fractions roughly paralleled concentrations of dissolved organic carbon. Most of the color of marsh, sound, nearshore, and offshore waters, once the particles were removed, was due to substances between 1,000 and 30,000 MW. (Witt-IPC)
W77-04809

BOISE MEASURES SLUDGE ULTRASONICALLY,
Boise Cascade Corp., St. Helens, Oreg.
For primary bibliographic entry see Field 5D.
W77-04825

PETROLEUM IDENTIFICATION BY LASER RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
M. Ahmadjian, and C. W. Brown.
Marine Reprint No 64. Reprinted from: Analytical Chemistry, Vol 48, No S, p 1257-1259, July 1976. 5 fig, 6 ref.

Descriptors: *Oil spills, *Pollutant identification, *Water pollution sources, *Spectroscopy, Analytical techniques, Oil pollution, Path of pollutants.
Identifiers: *Laser Raman Spectroscopy.

The fingerprinting of oil spills and the subsequent identification of the polluter is now carried out routinely by the U.S. Coast Guard. The possibility of using laser-Raman spectroscopy as an addition tool for the fingerprinting of oil spills has been investigated. The Raman spectra of No. 2 fuel oils, kerosenes, lubricating oils, weathered oils, and actual spill oils were measured. It was found that Raman spectroscopy provides a fast and simple method for the identification of petroleum products. It is highly suited for work with the lighter fuel oils where, because of the rapid changes which these oils undergo once they have been spilled, it is usually desirable to use several techniques to match them with their source. (NOAA)
W77-04843

LIGHT EXTINCTION MEASUREMENTS IN THE EXPERIMENTAL LAKES AREA--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. A. Shearer, and D. R. DeClercq.
Technical Report No. 646, 1976. 118 p. 4 ref., 4 append.

Descriptors: *Light penetration, *Measurement, *Canada, Depth, Lakes, Pollutant identification, *Data collections.
Identifiers: *Experimental Lakes(Canada), *Light extinction.

Light penetration measuremens, representing one year's data taken with a sensor designed to measure spectrum quanta between 400 and 700 millimicrons, of 16 lakes in the Canadian Experimental Lakes Area are detailed in two appendices. Appendix I gives the field measurements at each depth recalculated as percentage of surface value, along with the mean extinction coefficients for the depth intervals profiled. Appendix II details the same data as plots of percentage of surface irradiance against depth, in meters; percent of light is plotted on a logarithmic scale and depth on a linear scale. The units are recorded in microeinsteins sq m/sec. (Auen-Wisconsin)
W77-04862

CONNECTICUT RIVER BASIN PROGRAM. PART III, PHASE I. WATER QUALITY RECONNAISSANCE FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass., Region I.
For primary bibliographic entry see Field 5G.
W77-04871

METHOD OF SEPARATING ZOOPLANKTON AND PHYTOPLANKTON IN SESTON,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
M. Ya. Gavrilenko, T. I. Birger, and S. L. Gusynskaya.
Gidrobiol Zh 11(6), p 106-108, 1975.

Descriptors: *Zooplankton, *Phytoplankton, *Seston, *Separation techniques, *Cyanophyta, *Copepods, *Crustaceans, Daphnia, Light, Temperature, Hydrogen ion concentration, Pollutant identification.
Identifiers: Acanthocyclops-americanus, Anesthetic-drugs, Aphanizomenon-flos-aquae, Bosmina-coregoni, Chydorus-sphaericus, Cyclops, Daphnia-cucullata, Daphnia-hyalina, Diaphanosoma-brachyrum, Ethanol, Formalin, Leptodora-kindtii, Methanol, Microcystis-aeruginosa, Procaine, Shading, Urethane.

For a more accurate determination of the biochemical composition of seston it was separated into components by means of anesthesizing substances (urethan, procaine), alcohols (ethanol and methanol), formaline and physiochemical factors (temperature, pH, light and complete shading). The investigations were carried out on unfixed living seston samples containing a more or less homogeneous mass of 2 blue-green algae species (Microcystis aeruginosa and Aphanizomenon flos-aquae) and complex of zooplankton organisms, the bulk of which was composed of members of Copepods (Acanthocyclops americanus and juvenile Cyclops) and Cladocera (Chydorus spaericus, Daphnia hyalina, D. cucullata, Bosmina coregoni, Diaphanosoma brachyurum, Leptodora kindtii).-Copyright 1976, Biological Abstracts, Inc.
W77-04872

TOTAL SOIL FLUORIDE DETERMINATION BY A SINGLE DISTILLATION SELECTIVE ION ELECTRODE PROCEDURE,
Ohio Agricultural Research and Development Center, Wooster. Lab. for Environmental Studies.

For primary bibliographic entry see Field 2G.
W77-04885

A SQUEEZER FOR EFFICIENT EXTRACTION OF PORE WATER FROM SMALL VOLUMES OF ANOXIC SEDIMENT,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2J.
W77-04892

AN IN SITU SAMPLER FOR CLOSE INTERVAL PORE WATER STUDIES,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2K.
W77-04894

THE EFFECT OF SALT ON SMALL, ARTIFICIAL LAKES,
Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
D. S. Cherkauer, and N. A. Ostenso.
Water Resources Bulletin, Vol. 12, No. 6, p 1259-1266, December 1976. 4 fig, 1 tab, 10 ref.

Descriptors: *Wisconsin, *Salts, *Artificial lakes, Chlorides, Lakes, Lake beds, Hydrology, Water quality, Winter, Runoff, Watersheds(Basins), Salinity, *Pollutant identification.
Identifiers: Salinity stratification, Chloride concentration.

Northridge Lakes, in Milwaukee, Wisconsin, receive runoff from a 3.8 sq km drainage area. Almost 30% of the watershed is covered by shopping centers, apartment buildings, and roadways. Deicing agents used on the paved areas, primarily NaCl with some CaC12, dissolved in surface runoff and entered the lakes during the 1974-75 winter season. This highly saline inflow was denser than the receiving lake water and formed a saline water stratum at the lakes' bottom. The salinity stratification remained stable until the spring thaw, when a rapid decay began. After the stratification had disappeared, the lakes continued to act as a storage site for dissolved salts. Chloride concentrations in the lakes remained well above the levels found in natural lakes until the advent of the next salting season. Furthermore, outflow from the lakes also showed abnormally high salt concentrations year-round. (Lee-ISWS)
W77-04896

SYNOPTIC SURVEY OF HYPOLIMNETIC AERATION,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-04899

WATER QUALITY AND BATHYMETRY OF SAND LAKE, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04970

MAPS SHOWING GROUND-WATER CONDITIONS IN THE CONCHO, ST. JOHNS, AND WHITE MOUNTAINS AREAS, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04971

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W77-04975

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 2. WATER QUALITY RECORDS.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W77-04976

BACKFLUSHING FILTERS FOR FIELD PROCESSING OF WATER SAMPLES PRIOR TO TRACE-ELEMENT ANALYSES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
V. C. Kennedy, E. A. Jenne, and J. M. Burchard.
Water-Resources Investigations 76-126 (open-file report), November 1976. 12 p, 5 fig, 5 ref.

Descriptors: *Water sampling, *Filtration, *Separation techniques, *Trace elements, *Water analysis, On-site investigations, Methodology, Water quality, Heavy metals, Analytical techniques, *Pollutant identification.
Identifiers: Filter membrane, Suspended sediment, Backflushing filters.

A portable unit is described for filtering water samples at field sites in such a manner that the filtrate is suitable for analysis not only of major constituents but also of trace elments at the mocrogram-per-liter level. A battery-operated peristaltic pump forces the water sample through medical-grade silicone tubing into and through an all-plastic in-line filter which can be backflushed when sediment clogs the filter membrane. Initial filtration rate exceeds 500 milliliter/minute and, because of the backflushing feature, a total time for filtering high-sediment-bearing waster samples is greatly reduced. (Woodard-USGS)
W77-04981

RECONNAISSANCE WATER SAMPLING FOR RADIUM-226 IN CENTRAL AND NORTHERN FLORIDA, DECEMBER 1974--MARCH 1976,
Geological Survey, Tallahassee, Fla. Water Resources Div.
G. A. Irwin, and C. B. Hutchinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 376, Price codes: A02 in paper copy, A01 in microfiche.
Water-Resources Investigations 76-103, October 1976. 16 p, 1 fig, 3 tab, 3 ref.

Descriptors: *Water pollution sources, *radioactivity, *Radium radioisotopes, *Florida, Groundwater, Surface waters, Phosphates, Mining, Water quality, *Pollutant identification.
Identifiers: Central and northern Florida, *Radium-226.

Analyses of 115 water samples collected from December 1974 through March 1976 in eight Florida Counties indicated that 22 samples (19 percent) had radium-226 activities equal to or in excess of 3 piC/liter (picocuries per liter), the concentration limit recommended for drinking water by the U.S. Public Health Service. The maximum radium-226 activity was 90 piC/liter in water from a shallow well in Polk County. The sampling reconnaissance was generally limited to areas of active phosphate mining and areas of undisturbed phosphate deposits. Most of the sampling was from water wells. Thirteen surface-water samples were collected in the Peace River drainage basin. The maximum radium-226 detected in surface-water samples was 3.6 piC/liter in Little Charlie Creek at State Road 664A in Hardee County. (Woodard-USGS)
W77-04983

GRAPHIC AND ANALYTICAL METHODS FOR ASSESSMENT OF STREAM-WATER QUALITY--MISSISSIPPI RIVER IN THE MINNEAPOLIS-ST PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn. Water Resources Div.
S. P. Larson, W. B. Mann, IV, T. D. Steele, and R. H. Susag.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 377, Price codes: A04 in paper copy, A01 in microfiche.
Water-Resources Investigations 76-94, July 1976. 55 p, 23 fig, 7 tab, 12 ref.

Descriptors: *Water quality, *Water pollution effects, *Mississippi River, *Time series analysis, *Statistical methods, Water pollution sources, Water pollution treatment, Dissolved oxygen, Biochemical oxygen demand, Water temperature, *Minnesota.
Identifiers: *Minneapolis-St Paul area(Minn).

Historical records were analyzed to determine effects of population, pollution-control strategy, and other factors on water quality of the Mississippi River. Isopleths of DO (dissolved oxygen) concentrations and lines of equal stream temperature indicated periodic data could be used to guide sampling of certain critical conditions in time and space. Long-term records revealed generally mixed changes in quality in the Mississippi River. Several mean-time series were used to show seasonal variation in water quality and effects of initiation of wastewater treatment in 1938. Kendall's tau statistical test indicated a significant increase in DO in the upper reach of the river during the period of record. If only the post-1938 period is considered, DO conditions remained fairly constant below the metropolitan plant and biochemical oxygen demand increased throughout the main-stem reach. Significant trends in stream temperature were indicated for winter periods using Kendall's tau procedure. The Mann-Whitney statistical test gave estimates of a 98-percent confidence interval of the magnitudes of change. (Woodard-USGS)
W77-04984

EQUILIBRIUM STATISTICAL MECHANICAL CALCULATION OF THE MOLECULAR DIFFUSION COEFFICIENT FOR ISOTOPIC IMPURITIES IN LIQUID WATER,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 1B.
W77-04999

EMBRYOPATHIC EFFECTS OF WATER-BORNE AND SEDIMENT-ACCUMULATED CADMIUM, MERCURY AND ZINC ON REPRODUCTION AND SURVIVAL OF FISH AND AMPHIBIAN POPULATIONS IN KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5C.
W77-05003

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1973.
California State Resources Agency, Sacramento; and California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2L.
W77-05022

COLUMBIA BASIN SALMON AND STEELHEAD ANALYSIS, SUMMARY REPORT,
Biological Services, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5C.
W77-05077

CONTINUOUS MONITORING OF TOTAL DISSOLVED GAS PRESSURE, INTERIM TECHNICAL PROGRESS REPORT,
Virginia Mason Research Center, Seattle, Wash.

B. G. D'Aoust, and H. R. Seibold.
Prepared for EPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, Virginia Mason Research Center, Seattle, Washington, October 22, 1976, 26 p., 3 tab., 7 fig., 5 ref. EPA R804175010.

Descriptors: *Monitoring, *Dissolved gas, On-site investigation, *On-site data collection, *Methodology, Atmospheric gas, Statistics, Dam, Dam sites, Spillways, Atmospheric pressure, *Supersaturation, Water quality, Technology, *Pollutant identification.
Identifiers: Continuous monitoring, Total dissolved gas pressure, Nitrogen, Supersaturation, *Gas bubble disease, Supersaturation monitoring, *Dissolved gas pressure.

The first nine months of this work has seen the completion of three field studies using the continuous monitoring concept and laboratory testing of three different mechanical configurations. Work in the fall of 1976 is expected to concentrate chiefly on configuration and response time. During two separate periods, one in July and one in August-September, 1976, a dissolved as pressure sensor and recorder (DGP) was stationed in the tailrace of Bonneville Dam on the Columbia, and recorded (DGP) continuously for two-day and four-day periods. Hourly dam spill records for each period were obtained through the Bonneville project chief and spill plotted against (DGP) levels. Correlation coefficients of .91 and .98 were obtained for the two-day and four-day periods respectively, and allowed rather accurate prediction of supersaturation by the spill rate in 1000 ft3/second. This appears to demonstrate the advantage of the continuous monitoring concept, as a means of accurately relating river level temperature and spill rate to supersaturation on a real time basis. (Katz)
W77-05079

WATER RESOURCES SERVICE DISSOLVED GAS STUDY: INTERIM DATA SUMMARY,
British Columbia Water Resources, Victoria. Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-05080

WATER RESOURCES SERVICE DISSOLVED GAS STUDY: COMPILATION OF FIELD MEASUREMENTS,
British Columbia Water Resources, Victoria. Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-05081

REPORT ON THE RESULTS OF A MONITORING PROGRAMME FOR DISSOLVED GASES IN THE FRASER RIVER AND PEACE RIVER SYSTEMS, 1974,
British Columbia Water Resources Service, Victoria. Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-05082

AN ELECTRONIC MONITOR FOR TOTAL DISSOLVED GAS PRESSURE,
Virginia Mason Research Center, Seattle, Wash.
B. G. D'Aoust, R. White, and H. Siebold.
1974, 16 p., 2 fig., 3 ref.

Descriptors: Methodology, *Monitoring, Data collection, Measurement, *Supersaturation, Dissolved oxygen, Gases, *Physical properties, Fish disease, *On-site data collection, *Pollutant identification.
Identifiers: Tensionometers, Total dissolved gas tension, *Dissolved gas superaturation, Dissolved gas monitors, Weiss saturometer.

The environmental and biomedical problem of supersaturation of dissolved gas and the research related to it has produced a need for a more efficient means of neasuring and monitoring total dissolved gas pressure than those now inuse. A modification of the Weiss saturometer is described which equailibrates within eight minutes, is portable and can be operated remotely in a recording mode. The basic unit is inexpensive, easily constructed out of available components and allows many options in design so that such units can be custom made to specific needs. It has been field tested and is currently in use. (Katz)
W77-05083

PROGRESS REPORT ON CORPS OF ENGINEERS ACTIVITIES RELATED TO SUPERSATURATED GASES,
Army Engineer Div. North Pacific, Portland, Oreg.
E. M. Mains.
Presented to N2 Task Force, 14 February 1974, 5 p., 2 fig.

Descriptors: *Columbia River, *Supersaturation, Dams, Dam sites, Juvenile fish, Fish migration, Salmon, Spillways, Bioassay, *Oregon, On-site investigations, Water quality, Behavior, *Sampling, *Monitoring, *Pollutant identification.
Identifiers: *Gas supersaturation, Chinook salmon, Chinook salmon fingerlings, Bonneville Dam, Lower Monumental Dam, Little Goose Dam.

The Corps of Engineers has completed the gas sampling program and evaluated pertinent to determining the gas supersaturation potential of its run-of-river projects. Research of alternative methods for gas supersaturation control has been completed. The Corps of Engineers control program is outlined. (Katz)
W77-05086

NITROGEN SUPERSATURATION PROBLEM, PUBLIC MEETING, MARCH 23, 1971,
Army Engineer Div. North Pacific, Portland, Oreg.
R. S. Kelley.
March 23, 1971, 4 p.

Descriptors: *Columbia River, Grand Coulee Dam, Hydroelectric plants, Dams, Dam sites, Monitoring, On-site investigations, On-site data collection, Salmon, Spillways, Engineering, Engineering structures, Hydraulic turbines, *Supersaturation.
Identifiers: *Snake River, High spill period, Scale models, Field surveys, Nitrogen studies.

The program of the North Pacific Division Corps of Engineers in regard to the gas supersaturation problem of the Columbia and Snake Rivers is outlined. Plans include the evaluation of scale models and prototypes, special field surveys, research, data collection and analysis and the establishment of a coordinating committee called the Nitrogen Studies Task Group. (Katz)
W77-05088

REVIEW OF GAS SUPERSATURATION RESEARCH DONE BY NATIONAL MARINE FISHERIES SERVICE AT PRESCOTT FIELD FACILITY -- 1969-1974,
National Marine Fisheries Service, Longview, Wash. Prescott Field Facility.
For primary bibliographic entry see Field 5C.
W77-05091

RELATIONS BETWEEN FISH BEHAVIOR, BIOASSAY INFORMATION AND DISSOLVED GAS CONCENTRATIONS ON SURVIVAL OF JUVENILE SALMON AND STEELHEAD TROUT IN SNAKE RIVER,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-05092

A REPORT ON THE RESULTS OF A MONITORING PROGRAMME FOR DISSOLVED GASES IN SELECTED WATERS OF BRITISH COLUMBIA, 1972,
British Columbia Water Resources Service, Victoria. Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-05095

A REPORT ON RESULTS OF A MONITORING PROGRAMME FOR DISSOLVED GASES IN SELECTED WATERS OF BRITISH COLUMBIA, 1972-73,
British Columbia Water Resources, Victoria. Pollution Control Branch.
For primary bibliographic entry see Field 5C.
W77-05096

5B. Sources Of Pollution

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE I,
Kentucky Water Resources Research Inst., Lexington.
J. F. Quinlan, and D. R. Rowe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 831, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 101, January 1977. 93 p, 22 fig, 12 tab, 46 ref. OWRT A-062-KY(1), 14-31-0001-5017 and 14-34-0001-6018.

Descriptors: *Water quality, Management, *Karst, Dyes, *Kentucky, Hydrologic cycle, *Heavy metals, Effluents, Caves, *Path of pollutants, Springs, Tracers, Groundwater, Zinc, Copper, Chromium, Nickel, Water pollution sources, Wells.
Identifiers: Optical brighteners, Cave streams, Hidden River Cave stream(Ky).

Study of springs and cave streams has shown heavy metal-rich effluent from a wastewater treatment plant can be traced to Hidden River Cave (beneath the city of Horse Cave) and thence 4 to 5 miles north to a group of 39 springs at 14 locations along a 5-mile reach of Green River. Nickel, chromium, copper and zinc in these effluent-bearing springs are in concentrations of as much as 30 times greater than other springs upstream and downstream from this reach, 20 times greater than the Green River, and 60 times greater than in shallow domestic wells between Horse Cave and the river. Mean concentration ratios, based on samples taken during moderate to flood flow, are considerably lower. Water tracing over distances of as much as 15 miles has made it possible to delineate thirteen groundwater basins, eleven of them characterized by distributary flow. Study of the water quality of five adjacent groundwater basins showed that they could be geochemically differentiated. One of these, the Three-Springs Groundwater Basin, has a distributary complex that is 2.4 miles wide and its discharge is believed to be affected by brines released by drilling. Recommendations are made for: (1) the use of drainage basin maps for regional planning and protection of water supplies, (2) protection of other water supplies, and (3) development of specific springs as potential public water supplies. (Huffsey-Kentucky)
W77-04602

LAND APPLICATION OF WASTE MATERIALS.
Calf News, Vol. 14, No. 6, p. 28, June, 1976. 3 fig.

Descriptors: *Organic wastes, Nitrogen, Salts, Soils, Economics, Water pollution, Groundwater, *Farm wastes, Waste disposal.
Identifiers: *Land disposal, *Plant residues, *Forest residues, *Food processing wastes.

The Soil Conservation Society of America sponsored a national conference in Des Moines dealing

with the application of plant and forest residues and animal and food processing wastes to the land. In one paper presented by Dr. B. A. Stewart of Bushland, Texas, Agricultural Research Station, the following points were made concerning the ability of the soil to accept manure: (1) Applications of manure and other wastes should be made in dry seasons to minimize water pollution and denitrification losses. (2) Salt is the limiting factor in areas with less than one inch percolation per year such as West Texas. (3) Nitrogen is the limiting factor in high percolation areas east of the Mississippi River. (4) Sandy soils with low-cation exchange capacity can receive less waste than soils high in clay or organic matter which have a high-cation exchange capacity. Though a number of papers were presented, Dr. John Sweeten of Texas A and M found the following common threads in all presentations: (1) A farmer or rancher is generally safe in applying organic wastes at rates that balance available nitrogen in the waste material with plant nitrogen requirements. (2) Most of the so-called waste materials provide economic benefits if used wisely for agronomic purposes. (3) There is a tremendous amount of technical information availabe on land disposal of organic wastes. (4) Practicing good soil conservation will automatically keep nearly all the organic matter, nutrients and pesticides out of streams and groundwater. (Ott-East Central)
W77-04607

HANDLING DAIRY WASTES,
J. M. Rakes, and O. T. Stallcup.
Arkansas Farm Research, Vol. 23,No. 1, p. 14, 1974. 1 fig, 1 tab.

Descriptors: *Dairy industry, *Arkansas, *Water pollution, Groundwater, *Costs, Nutrients, Salts, *Farm wastes, Waste treatment, Application rates.
Identifiers: *Land disposal, Fly control.

Most of the dairy manure produced in Arkansas is applied to the soil. This may result in nitrogen accumulation in surface or ground waters. The key to solving this problem is to incorporate the manure into the soil at such a rate that the proper amount of nitrogen is made available for plant utilization for forage and grain production. Two methods of manure handling are compared -- scraping the manure into a pile and loading it with a front-mounted tractor loader and scraping it and then loading from a concrete ramp. Loading time was reduced 75 percent when the concreter ramp was used. It is estimated that the reduction in time and labor costs on a 35-cow herd would pay for ramp construction in 450 days, not including greater convenience, better manure utilization, fly control, and difference in machinery investment. In a study on incorporation of dairy lot manure into soil, manure was applied during October to a field of Boone orchardgrass and Victoria alfalfa. The field contained 3 types of soil. Rates of application were 100 tons and 10 tons per acre. Soil organic matter, potassium, sodium, and magnesium were higher following application at the 100 ton per acre level, while calcium content was higher in the plots receiving 10 tons per acre. Nutrient levels on the 100-ton treatment area were not detrimental to plant growth. Neither was salt accumulation. It is believed that most dairy farms in Arkansas have enough land available to permit manure application or incorporation at a rate that would allow utilization of nitrogen without deleterious accumulation. (Penrod-East Central)
W77-04610

EFFECTS OF AGRICULTURAL LAND USES ON RUNOFF QUALITY.
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W77-04612

CONFINED ANIMALS AND PUBLIC ENVIRONMENT,
Agricultural Extension Service, Stillwater, Okla. Feedlot Waste Management.
M. D. Paine.
Publication GPE-7000, University of Nebraska, Cooperative Extension Service, 1972, 4 p. 5 fig.

Descriptors: *Confinement pens, *Agricultural runoff, *Water pollution, *Groundwater, *Great Plains, *Cattle, Costs, Nutrients, Nitrates, Biochemical oxygen demand, *Farm wastes, Waste disposal.
Identifiers: *Land disposal, Total solids.

The major indicators for the magnitude of pollution in water are: total solids, biochemical oxygen demand, nitrates, and nutrients. Under normal circumstances, manure from cattle falls on land where the cattle eat. The amount of total solids or biochemical oxygen demand that reaches water depends upon rainfall which causes runoff. Research studies indicate that about 2 percent of the total possible biochemical oxygen demand loading reaches a water stream. Under severe conditions caused by heavy storms or snowmelt, up to 5 percent of the biochemical oxygen demand may reach a stream. In the past, feedlots that developed in the Great Plains caused severe pollution problems because climatic conditions were ignored and feedlots were built in convective thunderstorm areas. However, great headway has been made in those states through the use of runoff control measures. Another problem that must be guarded against is nitrate pollution of groundwaters under feedlots. In cases where the feedlot surface is lightly stocked, is maintained for only a portion of the year, or is abandoned without cleaning, natural processes break up the compacted lower layer and allow nitrates to move downward toward groundwater. There is little evidence of nitrate buildup under active feedlots. It is estimated that 80-100 million tons of manure must be hauled to adjacent cropland every year. However, the cost of processing solid waste from municipalities and industries is at least 40 times greater than hauling animal manure produced in confinement. Estimates of the total solid materials produced by animals must consider factors for confinement, moisture, and the type of ration. (Rowe-East Central)
W77-04617

FARM WASTE COMPOSTING PROCESS.
Effluent and Water Treatment Journal, Vol. 15, No. 9, p. 482-488, September, 1975. 1 fig.

Descriptors: *Pollution abatement, *Slurries, *Solid wastes, *Design, Waste disposal, *Farm wastes, Waste disposal fields.
Identifiers: *Composting, *Land disposal.

Dr. K. R. Gray and Dr. A. J. Biddlestone of the Chemical Engineering Department lead the Compost Studies Group at the University of Birmingham, which for the past 5 years has been studying the application of composting to the treatment of farm manure slurries. The Ministry of Agriculture is encouraging farmers to return to their fields as much animal manure as possible. A new process will enable farmers to do this without the previously attendant risk of pollution of the air, neighboring water courses or the soil. The key to the process is the efficient use of the head from a slurry-straw composting reaction to evaporate the water from the slurry, thereby leaving a solid compost product with no liquid effluent. The equipment consists of 4 specially constructed cubes maintained under forced aeration. In each cube a batch of slurry and straw is composted for about a month; the cubicle is then emptied and refilled. In Week 1, for a particular cubicle, slurry and the straw are carefully blended and the cubicle filled. The straw matrix filters out the suspended solids from the slurry and absorbs much of the liquor. In Week 2, the mass reaches its maximum composting temperature. The drainage liquor from the recycle tank is carefully sprayed over the composting mass and becomes totally evaporated into the stream of air being blown through the matrix. In Weeks 3 and 4, composting continues under forced aeration conditions but without any liquid recycle. The temperature starts to fall back and the cubicle is emptied at the end of week 4. The weight of the mass falls to 1/3 that of the original charge, owing to the enormous evaporation of water. The technique can handle manure slurries from any source--pigs, cattle, or poultry. The capital installed cost of a manufactured unit is likely to be about 10 pounds per pig place, 100 pounds per cow place. Labor needs for a 1000 pig or 100 cow unit are about 1/2 hour per day for cubicle filling and 1-2 hours per week for cubicle emptying and stockpiling the compost.)Ott-East Central)
W77-04619

FAECAL COLIFORMS AND FAECAL STREPTOCOCCI IN STREAMS IN THE NEW GUINEA HIGHLANDS,
Birmingham Univ. (England). Dept. of Civil Engineering.
R. Feachem.
Water Research, Vol 8, No 2, p 367-374, June, 1974.

Descriptors: *Water pollution sources, *Coliforms, *Streptococcus, *Public health, *Agricultural runoff, Hogs, Bioindicators, Streams, *Farm wastes.
Identifiers: *New Guinea, *Domestic water sources, *Pollution indicators.

A detailed study was made of fecal coliform and fecal streptococci concentrations in the streams of the Saka Valley in the Highlands of New Guinea. The Saka Valley supports large populations of humans and domestic pigs, whose feces are washed into the streams by surface runoff following rain. Researchers hoped to determine whether the fecal content of the streams, which are used as domestic water sources, would render the waters unsafe. If so, the researchers further wanted to determine what action could be taken to minimize this hazard. Study conclusions were: (1) Natural waters in the New Guinea Highlands are contaminated with fecal material, which may derive largely from herds of domestic pigs. (2) The polluted waters are used for all domestic water needs and are a health hazard. Only the spring water is of reasonable quality and the encouragement of greater use of spring water, and spring protection, are obvious public health improvement measures. (3) Fecal coliforms and fecal streptococci proved to be excellent indicators of fecal pollution in the New Guinea Highlands. The membrane filtration techniques, used to enumerate these bacteria, were highly suited to the remote field conditions and the primitive laboratory. (4) Fecal streptococci concentrations were extremely sensitive to animal pollution and peaked rapidly following stormwater runoff into the streams. (5) Water temperatures ranged from 13 to 26.2 degrees C and there was no evidence of coliform regrowth at these temperatures. This may be due to the absence of major discharges of domestic or industrial wastes into the streams. (Rowe-East Central)
W77-04620

INFILTRATION ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
L. N. Mielke, and A. P. Mazurak.
Presented at the 1975 Annual Meeting, American Society of Agricultural Engineers, University of California, June 22-25, 1975, Paper No. 75-4028, 14 p. 2 fig, 4 tab, 16 ref.

Descriptors: *Feed lots, *Cattle, *Infiltration rates, *Nitrates, *Soil profiles, *Groundwater, Permeability, Water pollution sources, *Farm wastes, Pollutant identification.
Identifiers: *Soil interface layer.

The most common criterion used to indicate water pollution is the nitrate-nitrogen (NO3-N) content. A common assumption is that since NO3-N is very soluble and mobile in water, where water goes, NO3-N goes also. A study was conducted at a Platt River Valley feedlot to determine some of the characteristics of infiltration of water into and water and gas movement through a feedlot profile. Since physical soil characteristics indirectly affect nitrogen conversion, they also directly influence the nitrogen status under the feedlot. Water infiltration in the feedlot was determined by the double-cylinder method. Two methods, the fixed hook and the float-controlled calibrated supply tank, were used. The equipment was protected from cattle destruction by a fence. Using a Giddings hydraulic soil probe, undisturbed feedlot soil cores encased in heat-shrink plastic were taken. The interface layer in the feedlot developed as a result of the hoof action and manure cover, and was the most restrictive layer to water movement. Study data showed that air and water permeabilities were lowest in the interface section and increased in the soil below. The average rate of water entry was 1.7 g/cm3 at 18 percent water content. It was concluded that undisturbed feedlot soil cores and feedlot interface material compacted at water content for maximum density are effective barriers to water movement. (Penrod-East Central)
W77-04625

INFILTRATION OF WATER ON A CATTLE FEEDLOT,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
L. N. Mielke, and A. P. Mazurak.
Transactions of the ASAE, Vol 19, No 2, p 341-344, March-April, 1976. 3 fig, 4 tab, 15 ref.

Descriptors: *Feed lots, *Infiltration rates, *Groundwater, *Hydraulic conductivity, *Porosity, *Bulk density, *Farm wastes, Water pollution sources, Pollutant identification.
Identifiers: *Manure pack, *Air permeability.

Four undisturbed soil cores from an active cattle feedlot, encased in heat-shrink plastic, were used in the laboratory to measure infiltration. Six additional undisturbed feedlot soil cores and 2 cores from adjacent cropland were taken for measurements of air permeability, hydraulic conductivity, porosity, particle-size distribution, bulk density, and organic matter content. Early field observations of outdoor cattle feedlots showed that a dense layer exists near the soil surface that apparently decreases water intake. Research results showed a low NO3-N content in the groundwater (1-2 m depth) in the immediate vicinity of the feedlot in contrast with much higher NO3-N content in wells under cropland. Water intake in the feedlot and into undisturbed complete feedlot soil cores was extremely slow (range from 0.38 x 10 to the 2nd power to 2.3 x 10 to the 2nd power cm/day). Air and water permeabilities were lowest in the interface section and increased in the soil below. Water permeability increased 28-fold between the interface layer and the next layer 10 cm deeper. Bulk density was 1.68 g/cm3 in the mineral soil in the interface layer. Interface soil showed maximum compaction of 1.70 g/cm3 at 18 percent water content. No water moved through the interface material during 6 days. Undisturbed feedlot soil cores and feedlot interface material compacted at water content for maximum density were found to be effective barriers to water movement, an important fact in understanding feedlot hydrology and protecting groundwater quality. (Rowe-East Central)
W77-04626

IMPACT OF FERTILIZERS AND AGRICULTURAL WASTE PRODUCTS ON THE QUALITY OF WATERS.
Organization for Economic Co-Operation and Development, Paris (France).
1973, 72 p. 4 fig, 9 tab, 47 ref.

Descriptors: *Water quality, *Water pollution, *Groundwater, *Nutrients, *Fertilizers, *Eutrophication, *Organic wastes, Economics, Leaching, Nitrogen, *Farm wastes, Phosphorus, *Agricultural runoff, Erosion, Irrigation, Legal aspects, Public health.
Identifiers: *Waste management, Environmental effects, Land application, Educational aspects.

Agricultural waste products (particularly animal wastes) and fertilizers make substantial contributions of nutrients to surface waters, thus contributing to the development of eutrophication. This report, based on an investigation conducted by the Organization for Economic Co-operation and Development Water Management Sector Group on Eutrophication of Surface Waters and its control, gives an evaluation of nutrient contribution to surface waters and indicates measures and practices that may be employed to reduce such contributions. Sources of nutrient enrichment of surface waters include industrial discharges, urban discharges, agricultural activities, and rainfall. The sources of nutrient loss from soil include those from soil organic matter, soil minerals, fertilizers and all types of organic manures. Mechanisms for nutrient losses which occur from agriculture to the water system are leaching, surface runoff, erosion and direct discharge of animal wastes. These vary considerably, depending on the agricultural system (e.g. crop rotation and fertilizer practice) and the geographical characteristics (e.g. climate, soil type, and slope.) The most serious source of nutrient losses from agriculture to water is from operations with high livestock densities. Since the range of climatic and geographical conditions, and the range of customary agricultural practices vary very greatly from region to region, only a general guide to remedial measures can be given. Factors that must be considered when proposing a change in customary practices include environmental aspects, employment, economic feasibility, need for food production, practical applicability and cost. A change in the education of the farmer is needed, which not only considers the economic factors of fertilizing operations, but also the environmental consequences of nutrient losses. (Penrod-East Central)
W77-04629

METHANE FROM FARM WASTES,
D. M. Paulin.
The Soil Association, Vol. 2, No. 4, p. 10, 20, April, 1974. 1 fig.

Descriptors: *Methane, *Recycling, *Fertilizers, *Biological treatment, *Organic wastes, *Design, *Anaerobic digestion, Copper, Air pollution, Water pollution, Soil contamination, Hogs, *Farm wastes.
Identifiers: *Refeeding, *Scotland.

The experiments in progress at the Rowett Research Institute and the Scottish Farm Buildings Investigation Unit, North of Scotland College of Agriculture, were started originally not so much for possible energy production as because of overall public concern about control of land, air, and water pollution. It was realized that biological treatment of farm wastes could lead to efficient recycling, but it was also realized that such treatment as is used in domestic sewage systems was not adequate because of the very much higher content of organic material in farm wastes. The team examining the problems, therefore, decided to experiment with anaerobic digestion, using wastes from an intensive pig unit. After experimenting with varying rates and different load mixtures, it was found that a mixture of sow-house and fattening-house waste (3.5 percent solids), with a loading rate of 100 gal/day and at a digester temperature of 35 degrees C, increased gas production to about 500 cu ft/day, comprising 68 percent methane and 32 percent carbon dioxide. However, the actual volume of gas produced depends on the composition of the waste as well as the volume. Three things seem within reach in the foreseeable future: (1) The production of useful fertilizer, complicated in the case of pig slurry by the indestructibility of the copper now apparently included in pig nutrition, (2) The production of feed recycled from the treated wastes, with the same reservations concerning pig wastes, and (3) The production of methane gas with potential for heating and for energy for static farm machinery. The ultimate goal is to produce a design for a cheap, easily run anaerobic plant for the ordinary farm. (Rowe-East Central)
W77-04630

POLLUTED GROUNDWATER: A REVIEW OF THE SIGNIFICANT LITERATURE,
California Univ., Berkeley. Dept. of Civil Engineering.
D. K. Todd, and D. E. O. McNulty.
Water Information Center, Inc., Huntington, New York, 1975, 179 p.

Descriptors: *Bibliographies, *Farm wastes, *Pesticides, *Herbicides, Pollutants, *Monitoring, Water pollution, Industrial wastes, Public health, Injection wells, Recharge wells, Waste disposal wells, Return flow, Irrigation.
Identifiers: *Literature reviews, *Urban pollution, *Agricultural pollution.

This literature review is concerned with groundwater pollution resulting from man's activities. Literature included was selected on the basis of its significance and relevance from a variety of bibliographies, general references, and abstracts. Excluded from consideration were all unpublished materials, administrative regulations at all government levels, and legal reports. The study was limited to literature of the United States, with the exception of a few Canadian reports and a recent book on the European groundwater pollution situation. Items of historical interest were excluded because they have limited bearing on the current and future pollution situation; only a few references predate 1950. Selections from research reports were restricted to those directly concerning changes in groundwater quality. Chapters II and III contain annotated listings of bibliographies and important general references. Thereafter the literature is reviewed in essay form on a subject basis, including: urban pollution, industrial pollution, agricultural pollution, pollution from wells, salt water and surface water, pollutants and effects, and evaluating pollution. (Merryman-East Central)
W77-04631

DEVELOPMENT AND APPLICATION OF A SIMPLIFIED STORMWATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W77-04637

ASSESSMENT OF MATHEMATICAL MODELS FOR STORM AND COMBINED SEWER MANAGEMENT,
Battelle Pacific Northwest Labs., Richland, Washington, Water and Land Resources Dept.
For primary bibliographic entry see Field 5D.
W77-04638

CHARACTERIZATION AND TREATMENT OF COMBINED SEWER OVERFLOWS,
San Francisco City and County Dept. of Public Works, Calif.
For primary bibliographic entry see Field 5D.
W77-04644

LAND APPLICATION OF WASTEWATER: THE FATE OF VIRUSES, BACTERIA AND HEAVY METALS AT A RAPID INFILTRATION SITE,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.

For primary bibliographic entry see Field 5D.
W77-04647

EVALUATION OF THE USE OF SLUDGE CONTAINING PLUTONIUM AS A SOIL CONDITIONER FOR FOOD CROPS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5D.
W77-04649

SIMULATED FIELD STUDY FOR I/I ANALYSIS,
For primary bibliographic entry see Field 5D.
W77-04662

FECAL COLIFORM AND FECAL STREPTOCOCCUS DENSITY RELATIONSHIPS IN WASTE DISCHARGES AND RECEIVING WATERS,
Municipal Environmental Research Lab., Cincinnati, Ohio.
E. E. Geldreich.
CRC Critical Reviews in Environmental Control, Vol 6, No 4, p 349-369, October, 1976. 4 fig, 12 tab, 130 ref.

Descriptors: *Water pollution sources, *Coliforms, *Streptococcus, *Pollutant identification, Farm wastes, Sewage effluents, Storm water, *Bioindicators.
Identifiers: Domestic sewage.

Density differences between fecal coliform (FC) and fecal streptococcus (FS) were determined as prospective water pollution source indices. The major concern was the use of FC/FS ratios to determine if pollution was primarily due to either humans or animals. These ratios should be developed from bacterial densities in water samples from the point of discharge or within a limited distance or flow time downstream for the most meaningful correlations. This was true because of environmental effects on organisms of fecal origin after diffusion in receiving waters. These ratios were observed to shift with age to a range of 0.7 to 3.0. Tests indicated that the contrast of density relationships between man and other warm-blooded animals was revealed in analyses of domestic sewage and storm water and, in cases where storm water collections and domestic sewage are combined, ratios are more concentrated and reflect the even-flowing inputs of domestic sewage. Conditions from various food processing and animal growing enterprises were assessed as they relate to FC/FS ratios. In summary, it was concluded that the FC/FS ratios could be valuable in determining pollution origins. (Collins-FIRL)
W77-04711

VIRUS MOVEMENT IN SOIL COLUMNS FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance, C. P. Gerba, and J. L. Melnick.
Applied and Environmental Microbiology, Vol 32, No 4, p 520-526, October, 1976. 4 fig, 5 tab, 16 ref.

Descriptors: *Viruses, *Sewage treatment, *Waste water treatment, *Pollutant identification, Movement, Soil contamination, Adsorption, *Path of pollutants, Salts.
Identifiers: De-ionized water, Desorption.

Experiments were designed to determine if soil could be saturated by viruses applied in secondary sewage effluent. Effluent containing 3 X 10 to the 4th power plaque-forming units of polio virus type 1 was applied to 250 cm long columns filled with loamy sand from basins used for infiltration of secondary sewage effluent. Average infiltration rates for the columns were 55 and 15 cm/day. Most viruses were removed from sewage in the first few centimeters of soil. Infiltration rate differences did not affect virus removal. Viruses were detected in samples from the 160 cm depth, but not from samples at 240 to 250 cm. Virus concentrations were reduced by about 2 logs during the first 2 cm, but traveled another 38 cm before being reduced by another log. Data indicated that near-surface factors other than adsorption were involved. Virus removal would be directly proportional to virus concentrations at any depth if adsorption were the only factor involved. Desorption of viruses was considerable with the application of deionized water. Desorption and virus movement were greatly decreased with the addition of CaC12 to the deionized water. Deionized water-induced desorption was prevented by drying the soil between applications of the sewage water-virus mixture. Results indicate that viruses would move through 250 cm of calcareous sand only if there were heavy rains within 1 day after stoppage of sewage application. Minimal viral movement would result from flooding with sewage soon after the rain began. Further research is suggested to determine the length of viability of adsorbed viruses. (Collins-FIRL)
W77-04712

PREDICTION OF VINYL CHLORIDE MONOMER MIGRATION FROM RIGID PVC PIPE,
Goodrich (B. F.) Research and Development Center, Brecksville, Ohio.
A. R. Berens, and C. A. Daniels.
Polymer Engineering and Science, Vol. 16, No. 8, p 552-558, August, 1976. 7 fig, 2 tab, 8 ref.

Descriptors: *Analytical techniques, *Forecasting, *Migration, *Plastic pipes, Model studies, Solubility, Diffusion, Resins.
Identifiers: *Polyvinylchloride pipe.

A predictive model was developed using data on the solubility and diffusion of vinyl chloride monomer (VCM) in PVC resin powders and Fick's diffusion equation solutions to determine the amount and rate of loss of residual VCM (RVCM) of rigid PVC pipe in service and storage. Good agreement between predictions and observation of RVCM from PVC pipe to water indicates that the diffusion coefficient of pure PVC resins is applicable to rigid PVC pipe compounds, and little change in VCM diffusivity is produced by PVC contact with water when compared to measurement by vapor sorption/desorption methods. The model can be used to estimate VCM concentrations in water resulting from actual use of PVC water pipe systems. The calculations presented may also be used in model dynamic flowing systems. Highest VCM concentrations are expected from new installations of recently manufactured small diameter PVC pipe after long periods of stagnation. In actuality, PVC pipe containing 1 mg/kg or less residual VCM produces VCM concentrations undetectable with present analytical methods. (Collins-FIRL)
W77-04720

SURVIVAL OF COLIFORM BACTERIA IN SEWAGE SLUDGE APPLIED TO A FOREST CLEARCUT AND POTENTIAL MOVEMENT INTO GROUND WATER,
Washington Univ., Seattle. Coll. of Forest Resources.
R. L. Edmonds.
Applied and Environmental Microbiology, Vol 32, No 4, p 537-546, October, 1976. 4 fig, 8 tab, 12 ref.

Descriptors: *Pollutant identification, *Coliforms, *Sewage sludge, *Clear-cutting, Movement, Groundwater, Environmental effects, Forest soils, Bacteria, Path of pollutants.

A 3-year study was undertaken to determine the environmental soundness of using dewatered sludge on clearcut areas in forests on gravelly glacial outwash soils, the survival of total and fecal coliform bacteria in sludge and soil systems relative to environmental conditions and time of year of application, and if fecal coliform bacteria in the sludge are capable of moving into soil and groundwater systems and into streams. Results indicated that few viable fecal coliforms penetrated greater than 5 cm into soil and that practically none entered the groundwater system. Though there was little movement of viable coliforms from sludge to soil, many moved to the 5 cm depth. The low fecal coliform count may result from filtration and sedimentation as well as poor competitive ability in soil. A total coliform maximum of 370/100 milliliters was detected in the lysimeter leachate at 180 cm. Seasonally, total coliform counts in groundwater revealed high numbers in the fall and low numbers in the winter. Most water movement through the soil profile occurred during winter when rainfall was high and the bacterial activity was low. It was concluded that, though fecal and total coliforms survive in sludge for long time periods, very little movement of either into groundwater systems occurs through the gravelly outwash soil. The soil is effective as a biological filter for hazardous pathogens. There is little danger of contamination of groundwater and streams from vertical bacterial movement. They can, however, remain viable in surface layers, and stormwater runoff and direct contact with contaminated soil is still a problem. (Collins-FIRL)
W77-04723

WHY SIMULATION,
For primary bibliographic entry see Field 2E.
W77-04725

GROUNDWATER POLLUTION FROM A SEPTIC TILE FIELD,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
T. Viraraghavan, and R. G. Warnock.
Water, Air, and Soil Pollution, Vol. 5, No. 3, p 281-287, April, 1976. 1 fig, 4 tab, 5 ref.

Descriptors: Water pollution, *Water pollution sources, *Soil disposal fields, *Septic tanks, *Percolation, Permeability, *Groundwater, Biochemical oxygen demand, Chemical oxygen demand, Carbon, Phosphates, Nitrogen, Chlorides, Microorganisms, Coliforms, Streptococcus, Pseudonomas.

The characteristics of groundwater pollution below a septic tile field were studied. Soil in the test area was a combination of Piedmont (sandy loam) and Pontiac (silt loam to clay loam) and the topography was undulating with steeply sloping banks, stone- and outcrop-free. Grain-size analysis, percolation, and permeability tests were performed. The subsurface tile field system, operated for three years, treated effluent from a 5625 liter capacity septic tank. Groundwater samples were taken at four locations near three of the ten laterals in the system. Analysis was done for pH, total suspended solids (TSS), 5-day biochemical oxygen demand (BOD), chemical oxygen demand (COD), soluble organic carbon (SOC), total phosphates, ammonia nitrogen, nitrate nitrogen, total soluble iron, chloride, indicator organisms (coliforms, fecal coliforms and streptococci), and Pseudomonas aeruginosa. Observations showed that groundwater pollutant concentrations were significantly lower than in septic tank effluent due to dilution and passage through soil. Compared to background levels, concentrations were higher, especially COD, SOC, total phosphates, ammonia, and chlorides. Total phosphate levels of 21.6 milligrams/liter and ammonia nitrogen levels of 50-75 milligrams/liter were observed under one lateral. Chlorides were seen to increase by 20-30 milligrams/liter under two laterals. Soil removed much of the pollutants from septic tank effluent, but concentrations in groundwater varied substantially due to variations in the depth to groundwater table and the non-uniform loadings resulting from the hydraulics of the system. (Collins-FIRL)

W77-04728

EFFECT OF MUNICIPAL LANDFILL LEACHATE ON MERCURY MOVEMENT THROUGH SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
E. E. Niebla, N. E. Korte, B. A. Alesii, and W. H. Fuller.
Water, Air, and Soil Pollution, Vol. 5, No. 4, p 399-401, June, 1976. 2 tab, 8 ref. EPA-68-03-2808.

Descriptors: Pollutant identification, *Municipal wastes, *Landfills, *Waste disposal, Soil chemistry, *Leachate, *Mercury, Adsorption, *Path of pollutants, Leaching, Water pollution.

The effect of sanitary landfill effluent on mercury attenuation by soils was evaluated. Test soils (Anthony sandy loam, Davidson clay, Fanno clay, and Chalmers sity clay loam) were packed in PVC pipe, 5 centimeters in diameter and 10 centimeters long. Three columns of each were subjected to leaching solutions of simulated landfill leachate (75 ppm Hg), de-ionized water with HgC12 (90 ppm Hg), and de-ionized water with 0.25 mM Na2 EDTA (90 ppm Hg). The high concentrations minimize vaporization loss and compensate for container adsorption. Solutions were adjusted to pH 5. Results showed that mercury in landfill leachate was more mobile than that in de-ionized water. The similar data for Chalmers and Fanno soils indicated that leachate composition was more important than soil properties. Mercury in EDTA and leachate solutions were alike for Anthony and Chalmers soils, but mercury in the EDTA solution was most mobile in Anthony soil. The assumption is that chelation is not the only factor involved in mercury mobility. Several other organic compounds and complexes may play a part in mercury mobility. It was concluded that mercury adsorption in soils is more effective from water than the simulated sanitary landfill leachate. The composition of the leaching solution should be adequately characterized in order to predict mercury mobility. (Collins-FIRL)
W77-04729

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS.
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 163, Price codes: A19 in paper copy, A01 in microfiche. Report EPA-670/2-75-065, August, 1974. 435 p, 129 fig, 53 tab, 386 ref. F. A. DiGiano and P. A. Mangarella, editors.

Descriptors: *Sewerage, *Analytical techniques, *Storm drains, *Combined sewers, *Rainfall intensity, Waste treatment, Water quality, Computer programs.
Identifiers: *Peak storm flow.

Instructional papers have been compiled to encourage consultants to use storm water models in dealing with combined and storm sewer overflows and make state pollution control agencies aware of this tool in their pollution abatement efforts. Emphasis was placed on presentations of various types of models, their data requirements, and case studies in which they were used. The Environmental Protection Agency Storm Management Model (SWMM) is highlighted. (See W77-04731 thru W77-04743) (Snyder-FIRL)
W77-04730

ENVIRONMENTAL IMPACT OF URBAN STORMWATER RUNOFF,
American Society of Civil Engineers, New York. Urban Water Resources Research Program.
M. B. McPherson.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 11-82. 4 fig, 4 tab, 198 ref.

Descriptors: *Sewerage, *Analytical techniques, *Storm drains, *Combined sewers, *Water quality, Computer programs, Runoff, Urban runoff.
Identifiers: Peak storm flow.

Urban storm water runoff and mathematicl models describing it are discussed. Peak drainage runoff rates can be reduced by means of proper land-development design. The bulk of storm drainage systems convey very modest flow rates, substantiating the surmise that the majority of catchments replace mainly fringe tributary natural channels. The most dramatic hydrologic impact of urban development is that on peak flows, where the basin lag time is reduced as an area becomes urbanized. Structural means for mitigating floodplain inundation are designed to provide a much higher level of protection than that for storm drainage systems. Pollution from storm sewer discharges can be almost as severe as that from combined sewer overflows. Substantial departures from traditional underground systems that remove storm water as rapidly as possible are required for enhancement of urban environment, conservation of water resources, and reducing water pollution. The rational method of sewer design involves numerous artificialities. For preliminary analysis and design of specific projects, the use of the simplest models is recommended. Ad hoc temporary rainfall-runoff-quality measurements to calibrate and verify the crude models used are recommended. Opportunities for design application of more detailed modeling techniques may arise if actual field data is available. Use of more detailed models is mainly justified to give a better insight into the underlying processes and develop more rational understanding of the simpler models. Exploration of meteropolitan-wide pollution-control alternatives should employ the simplest mass-balance and mass-routing techniques. Most models require a computer for efficient calculation. (See also W77-04730) (Snyder-FIRL)
W77-04731

QUANTITY ASPECTS OF URBAN STORMWATER RUNOFF,
Espey, Huston, and Associates, Inc., Austin, Tex.
For primary bibliographic entry see Field 4A.
W77-04732

QUALITY ASPECTS OF URBAN STORMWATER RUNOFF,
Water Resources Engineers, Inc., Walnut Creek, Calif.
L. A. Roesner.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 138-158. 7 fig, 6 tab, 7 ref.

Descriptors: *Sewerage, *Analytical techniques, *Biochemical oxygen demand, *Chemical oxygen demand, *Combined sewers, Water quality, Runoff, Urban runoff.
Identifiers: Peak storm flow.

The biochemical oxygen demand (BOD) and solids loads in urban runoff are significantly higher than those in combined sewer overflows. Pollutant loads are introduced into urban runoff from three sources: the land surface itself, catch basins, and the sewers in combined sytems. The pollutant types found in greatest quantity are chemical oxygen demand (COD), BOD, and solids; nitrogen and phosphorus are also significant. The amount of runoff, and hence the pollution loads, contributed from pervious surfaces in uran areas is small compared to that coming from the impervious areas. An equation gives the rate of dust and dirt buildup for a given land use on urban watersheds. The amount of pollutant remaining on the watershed decays exponentially for a constant runoff rate. Depending on the travel time in the transport sytem and the time to peak for the individual pollutographs, the resultant pollutograph at the outfall may have a high peak due to individual peaks arriving simultaneously or a lower peak and broader base if the travel time in the sewer system is long compared to travel time on the individual watersheds. changing a park to a multiple residence area would increase imperviousness and produce a seven-fold increase in peak-runoff. Since the major contribution to urban runoff pollution comes from the land surface itself, control of the pollution problem should start there. (See also W77-04730) (Snyder-FIRL)
W77-04733

IMPACT OF STORMWATER RUNOFF ON RECEIVING WATER QUALITY,
Water Resources Engineers, Inc., Walnut Creek, Calif.
L. A. Roesner.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 159-176. 9 fig, 5 tab, 10 ref.

Descriptors: *Water quality, *Runoff, *Urban runoff, *Storm water, *Storm runoff, *United States, Cities, Waste water disposal, Natural streams.

Currently, every United States city ultimately dispose of much of its storm runoff in natural surface watercourses. The impact of this disposal on receiving water quality depends principally on the quality and quantity of the discharge or discharges, the type of body of water into which the storm water is discharged, and outfall location. The pollution potential of storm water is shown, and some examples are presented of the impact on receiving waters. Considerations that are involved in assessing storm water discharge impact on the quality of receiving water are discussed. (See also W77-04730) (Snyder-FIRL)
W77-04734

INTRODUCTION TO URBAN STORMWATER RUNOFF MODELS,
Water Resources Engineers, Inc., Springfield, Va.
R. F. Shubinski.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 177-199. 15 fig, 4 tab, 6 ref.

Descriptors: *Rainfall intensity, *Water quality, *Runoff, *Urban runoff, *Storm water, Storm runoff, Mathematical models, Cities, Peak discharge.
Identifiers: Peak storm flow.

The urban drainage system can be viewed as an assemblage of subsystems dealing with surface runoff, transport of flow and quality, and the receiving water. Each drainage subarea is characterized by its area, degree of imperviousness, slope, and production of quality constituents. Overland flow modifies the rainfal hyetograph by infiltration, surface retention, and transient storage. The transport subsystem conveys storm waters and associated pollutants from the inlets through an underground conduit network to disposal points. The receiving water may be a stream, lake, estuary, or coast. The impcat will probably be assessed in terms of the concentration of a particulare pollutat. Increased imperviousness is associated with urbanizatin. Location of impervious areas in the watersheds, proximity and geometry of drainage systems, and building practices should be considered in analyzing runoff from impervious areas. The dominant hydrologic factors in the rainfall-ru-

noff process are rainfall, infiltration, storage, and detention. Land use profoundly influences urban runoff quantity through its effects on imperviousness and surface cover. Storm discharge from an urban watershed can best be analyzed by dividing the total basin into smaller homogeneous units. A stormwater model was applied to a watershed to determine the influence on storm water quality and quantity that might be expected with a land use change. Storage reservoirs and detention ponds which increase runoff travel time in selected reaches of a watershed can reduce peak flows during storm water runoff. Other storage concepts include in-line storage in existing main sewers. (See also W77-04730) (Snyder-FIRL)
W77-04735

SIMPLIFIED METHODS OF COMPUTING THE QUANTITY OF URBAN RUNOFF,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 2E.
W77-04736

THE WRE STORM MODEL,
Water Resources Engineers, Inc., Springfield, Va.
R. P. Shubinski.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 214-241. 8 fig, 5 tab, 9 ref.

Descriptors: *Waste water treatment, *Analytical techniques, *Biochemical oxygen demand, *Water quality, *Rainfall intensity, Waste treatment, Computer programs, Runoff, Urban runoff.

The present and expected future magnitude of pollution loads carried by urban runoff from a given watershed must be determined before developing a pollution control plan. A computer program, STORM, is presented that estimates the quantity and quality of runoff from small, primarily urban, watersheds. Land surfaces erosion, suspended and settleable solids, biochemical oxygen demand (BOD), total nitrogen and orthophosphate are calculated. The model considers the interaction of precipitation; air temperature for snowmelt; runoff, pollutant accumulation on the land surface, and land surface erosion; treatment rates; storage; and overflows. The program requires about 35,000 words of core storage and a FORTRAN IV complier that accepts multiple ENTRY statements. (See also W77-04730) (Snyder-FIRL)
W77-04737

THE EPA STORMWATER MANAGEMENT MODEL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. C. Huber, and J. P. Heaney.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 242-246. 1 fig, 4 ref.

Descriptors: *Waste water treatment, *Analytical techniques, *Mathematical models, *Rainfall intensity, *Waste treatment, Water quality, Computer programs, Runoff.
Identifiers: *Storm Water Management Model(SWMM).

A comprehensive mathematical computer simulation program was developed to model flow and quality during the total urban rainfall-runoff process. It provides an accurate representation of the physical system and an opportunity to determine the effect of proposed pollution abatement procedures. The Storm Water Management (SWMM) was developed, demonstrated, and verified. It has been documented and is currently in use. The SWMM is descriptive and models most urban configurations encompassing rainfall, runoff, drainage, storage/treatment, and receiving waters. Program segments correspond to physical components of the urban runoff process, and it has preliminary decision-making capabilities. Many changes have been made in details of the original program, input/output requirements, and data descriptions. (See also W77-04730) (Snyder-FIRL)
W77-04738

DECISION-MAKING FOR WATER QUANTITY AND QUALITY CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W77-04739

SELECTED CASE STUDIES USING STORMWATER MANAGEMENT MODELS -- QUANITITY ASPECTS,
Orlob (G. T.), and Associates, Orinda, Calif.
For primary bibliographic entry see Field 2E.
W77-04740

PLANNING A STUDY USING STORMWATER MANAGEMENT MODELS,
Orlob (G. T.), and Associates, Orinda, Calif.
G. T. Orlob.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 269-279. 5 fig, 1 ref.

Descriptors: *Analytical techniques, *Computer programs, *Storm water, *Design, *Mathematical models, Planning, Water management(Applied), Computer models.
Identifiers: *Storm Water Management Model(SWMM).

Mathematical modeling makes it possible to expeditiously examine large numbers of complex alternatives. It may serve to study designs, sizing system elements, alternative routings, impact of off-line storage, control measures, and land and water use planning schemes. If the model is well conceived and tested the user may anticipate a productive effort with only the normal computer problems. However, things seldom run smoothly with computer models. The Storm Water Management Model package is briefly described. Points where trouble may arise and ways to avoid it, if possible, are discussed. The planning process is examined, including the technique for bringing the models up to speed and to bear on the real problems to be solved. This includes the model development process, calibration, and application. Once the Storm Water Management Models are calibrated and verified, providing the user with some appreciation of their reliabilities and fallibilities, they can be employed best to discriminate between alternative choices. (See also W77-04730) (Snyder-FIRL)
W77-04741

THREE CASE STUDIES ON THE APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Boston, Mass.
J. P. Vittands.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 280-332. 19 fig, 13 tab, 5 ref.

Descriptors: *Waste water treatment, *Sewerage, *Analytical techniques, *Treatment facilities, *Combined sewers, Storm drains, Rainfall intensity, Computer programs.

A program was started for the systematic evaluation of the existing system, and preparation of a plan and program for the reconstruction of the inadequate segments of the sewer system in the Easterly District of Cleveland, Ohio. The flooding conditions and transport capabilities in the existing system were determined by computer simulation. Based on these results, the necessary sewer sizes were estimated to eliminate flooding under the design storm conditions. Computer simulation was used to test the selected improvements. A comprehensive engineering evaluation was also conducted with respect to abatement of pollution rom combined sewer overflows to the Great Miami River in Middletown, Ohio. All combined sewer outfalls connect to an interceptor by junction chambers designed to regulate flows so that the major portion of flow during storm runoff passes to the river. Records sometimes show reduced flow to the treatment plant during rainfall periods, indicating that the regulators, as presently operated, perform a negative function for water pollution control. The biggest pollution problem confronting Boston Harbor was identified as the combined sewer discharge problem which has been causing bacterial contamination and visual pollution of beaches and shellfish areas. The Storm Water Management Model (SWMM) is being used to model approximately 24,000 acres of combined and separate sewered areas in metropolitan Boston. Measurements at a Cambridge overflow were compared favorably with hydrographs generated by the SWMM under similar conditions. (See also W77-04730) (Snyder-FIRL)
W77-04742

COMPARATIVE ANALYSIS OF URBAN STORMWATER MODELS,
Battelle Pacific Northwest Lab., Richland, Wash.
A. Brandstetter.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 333-420. 26 fig, 5 tab, 60 ref.

Descriptors: *Sewerage, *Analytical techniques, *Storm drains, *Combined sewers, *Rainfall intensity, Water quality, Computer programs, Runoff.

Eighteen mathematical models for the nonsteady simulation of runoff in urban storm and combined sewerage systems were reviewed based on information from model builders and users. The seven most promising models were also tested by computer runs using hypothetical and real catchment data. Most include nonsteady simulation of the rainfall-runoff process and flow routing in sewers; a few also include waste water quality simulation, options for dimensioning sewerage system components, and features for realtime control of overflows during rainstorms. The models vary greatly in scope and purpose, mathematical detail, system elements and hydrologic phenomena being modeled, size of the system that can be handled, data input requirements, and computer output. Their state of development also varies significantly. Evaluations considered model accuracy, cost of model use, computer requirements, data requirements, input data preparation requirements, and output options available. All eighteen are suitable for simulation of storm and combined sewerage systems or incorporation in comprehensive simulation models. Considerable differences exist in the types of phenomena modeled and mathematical formulations for each phenomenon. If only a few physical phenomena need to be modeled, the simplest model simulating them with adequately accurate mathematical formulations should be selected. (See also W77-04730) (Snyder-FIRL)
W77-04743

DETECTION OF TRENDS IN WATER QUALITY DATA FROM RECORDS WITH DEPENDENT OBSERVATIONS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.

W77-04753

WASTEWATERS IN THE VADOSE ZONE OF ARID REGIONS: HYDROLOGIC INTERACTIONS,
J. F. Mann, Jr.
Ground Water, Vol. 14, No. 6, p 367-373, November-December 1976. 6 fig, 12 ref.

Descriptors: *Waste storage, *Waste water disposal, *Arid lands, *Vadose water, *Nevada, Groundwater recharge, Evapotranspiration, Soil water, Water table, Moisture content, Field capacity, Pollutants, Soil water movement, Infiltration, Leachate, Nuclear meters, Clays, Storage, Monitoring.
Identifiers: *Xerophytes, Tailings ponds, Ash.

In truly arid regions there is essentially no direct penetration of rainfall. Such water is quickly dissipated by capillarity-assisted evaporation or through rapid evapotranspiration by short-lived annuals. Where perennial xerophytes cover the ground surface, the extensive shallow root systems quickly utilize all of the rainfall stored in the soil. Beneath the soil zone is the lower part of the vadose zone, extending to water tables at depths of tens to hundreds of feet. Almost always these vadose zones have moisture contents well below field capacity. Regardless of the cause, these dry vadose zones are capable of holding additional water, at least up to field capacity. And no water-carried pollutants can reach the water table from the ground surface until a pre-wetted path has been formed for the entire vertical distance. A practical use of this water-holding capacity can be made in the design of wastewater tailings ponds, with predictable safety and with great economic benefit. However, only in predictable geologic conditions, and in limited amounts can the use of this water-holding capacity be recommended. On the other hand, to make no use whatsoever of these great natural dry sponges would be an economic waste. (See also W77-04755) (Visocky-ISWS)
W77-04754

WASTEWATERS IN THE VADOSE ZONE OF ARID REGIONS: GEOCHEMICAL INTERACTIONS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2K.
W77-04755

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, Mich. Hiawatha National Forest.
N. Johnson, and D. H. Urie.
Ground Water, Vol. 14, No. 6, p 403-410, November-December 1976. 5 fig, 4 tab, 3 ref.

Descriptors: *Sewage disposal, *Water pollution, *Michigan, *Groundwater, *Recreation wastes, National forests, National recreation areas, Forests, On-site investigations, Laboratory tests, Wells, Sampling, Nitrates, Nitrites, Nitrogen, Phosphorus, Bacteria, Sewage bacteria, Coliforms, Vegetation.

Local groundwater pollution problems are often associated with disposal of sewage from remote recreatioal areas. Groundwater in these areas is routinely used for domestic purposes without treatment. Sewage treatment facilities are often prohibitively expensive. Transporting sewage to municipal sewage treatment facilities is often equally costly, or adequate facilities are not available. A soil incorporation method was tested at two field sites in Michigan's Upper Peninsula to evaluate its impact on groundwater quality. Liquefied campground sewage was injected at 15 cm (6 in) depths, using a liquid manure system. Average dosage levels were 2.7 metric tons per hectare (1.2 ton/acre) of dry seage solids. The application rate was equivalent to a fertilization rate of 116 kg/ha (104 lb/a) of total nitrogen. Field tests were conducted on adjacent strips of Kalkaska sand soils in 1973, 1974, and 1975. Changes in groundwater quality in the zone immediately beneath the water table were evaluated by analyzing samples from randomly located wells. Nitrate levels in groundwater at 3.6 m (12 ft) depths were higher than control levels from the treated zone to the limit of the test well sampling. Levels of nitrate did not exceed the limits for potable water (10 mg/l NO3-N). No fecal coliform organisms were detected in groundwater samples. Laboratory tests of the filtration capability of the A and B horizons indicated a high level of filtration of polio virus. Fertilization with sewage increased the biomass of native herbaceous vegetation by 410%. (Sims-ISWS)
W77-04756

PREDICTION OF FUTURE NITRATE CONCENTRATIONS IN GROUND WATER,
Water Research Centre, Marlow (England). Medmenham Lab.
C. P. Young, D. B. Oakes, and W. B. Wilkinson.
Ground Water, Vol. 14, No. 6, p 426-438, November-December 1976. 20 fig, 3 tab, 29 ref.

Descriptors: *Nitrates, *Groundwater, *Forecasting, Surveys, On-site investigations, Model studies, Mathematical models, Aquifers, Foreign countries, Sandstones, Foreign projects, Nitrogen, Chlorides, Tritium, Fertilizers, Wells, Water wells, Land use, Effects, Agriculture, Water pollution, Pollutants.
Identifiers: *England, Chalk Aquifers, Predictive models.

Over the last few years, rises in the nitrate content of groundwater from wells and springs in the principal aquifers of the United Kingdom have been observed. In a number of cases, the concentrations have exceeded the WHO lower recommended limit. In order to determine the reason for the rise, to assess whether it will continue, and to ascertain the eventual nitrate levels, the Water Research Centre undertook an extensive program of drilling and sampling on the Chalk and Bunter Sandstone. By August 1976, 22 sites had been examined. This work established that high nitrate concentrations (peaks up to 60 mg/l NO3-N have been observed) are present in the unsatruated aquifers at fertilized arable/ley sites. At unfertilized grassland sites, nitrate concentrations are low (less than 4 mg/l NO3-N), and they are below fertilized established grassland values, which are in the intermediate range. At one farm site near Winchester, models to predict the rate of movement of nitrate through the unsaturated and satruated Chalk were developed. These models suggest that the nitrate levels at this site will remain at an essentially constant value of about 4 mg/l NO3-N until the late 1970's, when they will rise progressively to about 14 mg/l NO3-N. The models were checked against trituim data, and the approach is now beng extended to other sites. (Sims-ISWS)
W77-04757

THE CONTRIBUTION OF FERTILIZER TO THE GROUND WATER OF LONG ISLAND,
Suffolk County Dept. of Environmental Control, Hauppauge, N. Y. Fresh Water Resources Section.
J. H. Baier, and K. A. Rykbost.
Ground Water, Vol. 14, No. 6, p 439-447, November-December 1976. 6 fig, 4 tab, 14 ref.

Descriptors: *Nitrogen, *Groundwater, *Fertilizers, *New York, Aquifers, Farm management, Fertilization, Crops, Potatoes, Turf grasses, Agriculture, On-site investigations, Water quality, Pollutants, Nitrates, Water pollution, Path of pollutants.
Identifiers: *Long Island(NY).

In 1973, the Suffolk County Department of Environmental Control, in cooperation with Cornell University, bgan a study on nitrogen (N) fertilization of potatoes and turf grasses. The research and demonstration project showed that current practices result in substantial N losses; and, in many cases, excessive use of N reduces crop yields and turf quality. Annual N losses of 50 lbs per acre (55.5 hg/N/ha) are sufficient to cause a concentration in the aquifer's surface layer of 10 mg/l nitrate-N. The eastern portion of Long Island supports a productive agricultural industry whose main crop is potatoes. Groundwater surveys have shown that the aquifer system of this area is contaminated with nitrate nitrogen. The average potato grower applies 200 to 250 lb-N/a (222 to 278 kg/N/ha) at planting time; and, depending upon a number of factors, N recovered in harvested tubers varies from 75 to 150 lb-N/a (83 to 167 kg/N/ha). Losses to the groundwater could vary from 50 to 175 lb-N/a (55.5 to 194 kg-N/ha). The western portions of Long Island are highly urbanized, and surf grasses may be fertilized at rates up to 350 lb-N/a (389 kg-N/ha). Potential leaching losses are high for turf grass as N is not recovered in harvested plant materials. (Sims-ISWS)
W77-04758

DESIGN AND OPTIMIZATION OF GROUNDWATER MONITORING NETWORKS FOR POLLUTION STUDIES,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5A.
W77-04759

MONITORING CYCLIC FLUCTUATIONS IN GROUND-WATER QUALITY,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
W. A. Pettyjohn.
Ground Water, Vol. 14, No. 6, p 472-480, November-December 1976. 9 fig, 13 ref.

Descriptors: *Water quality, *Groundwater, *Groundwater recharge, *Water pollution, Monitoring, Sampling, Wells, Water wells, Path of pollutants, Chlorides, Brines, Oil fields, Rainfall, Precipitation(Atmospheric), Aquifers, Pollution, Fluctuations, Pollutants.
Identifiers: Cyclic fluctuations.

The chemical quality of water in many shallow and surficial aquifers exhibits cyclic fluctuations. These fluctuations are caused by the intermittent flushing of contaminants into the ground during recharge events. The contaminants may be natural or reflect man's activities, particularly waste disposal schemes. Over the past 12 years, an oil field, brine-contaminated aquifer in central Ohio has been monitored. Data from three closely spaced wells tapping selected parts of the aquifer indicated that brine is flushed into the ground during recharge events, and that each contaminated mass maintains much of its integrity as it sinks to the bottom of the aquifer and then migrates laterally to the adjacent river. The most concentrated mass that covers the largest area infiltrates during the spring recharge period, but less concentrated and smaller masses may occur any time rainfall is sufficient to overcome the soil moisture deficiency. Because of the cyclic nature of recontamination events, care and common sense must be exercised in the extrapolation of quality data, particularly in regard to estimation of contaminant flushing rates. (Sims-ISWS)
W77-04760

MOVEMENT OF WATER AND NITRATE IN AN UNSATURATED AGGREGATED SOIL DURING NONSTEADY INFILTRATION--A SIMPLIFIED SOLUTION FOR SOLUTE FLOW,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
V. Balasubramanian, L. R. Ahuja, Y. Kanehiro, and R. E. Green.

Soil Science, Vol. 122, No. 5, p 245-255, November 1976. 7 fig, 1 tab, 13 ref.

Descriptors: *Soil water movement, *Infiltration, *Nitrates, *Hawaii, Model studies, Mathematical models, Laboratory tests, Diffusion, Diffusivity, Soils, Soil physical properties, Moisture content, Unsaturated flow, Ions, Solutes, Soil science, Path of pollutants.
Identifiers: *Nitrate movement, *Molokai(Hawaii), Solute transport.

Dynamics of water and nitrate movement during infiltration under unsaturated conditions was examined in highly aggregated (0-2 mm size) Molokai soil. Experiments mainly involved horizontal infiltration into packed soil columns at three different initial water contents. Ammonium nitrate was mixed in the top 5 cm of soil immediately before or a week preceding the start of water application. After 3 or 4 different depths of wetting, the columns were sectioned to determine water content and nitrate distribution in the soil. Uniqueness of the experimental soil water content vs distance/square root of time relationships and soil water diffusivities for different initial soil water contents indicated the validity of the simple diffusion theory for flow of water in this aggregated soil. Measured nitrate profiles also showed that the initial water within the micropores is mobile and miscibly displaced by applied water to form the wetting front. Comparison of the velocity of movement of the nitrate peak with the velocity of movement of water at the peak indicated that nitrate ions moved with water at a medium initial soil water content. At a higher initial value, the nitrate peak was retarded by a factor of 0.75, while at a very low initial water content, it was somewhat enhanced (by a factor of 1.13). The velocity of water at the peak was very nearly equal to the velocity of water at the inlet end of the column. A simplified solution derived from solute flow under the time-dependent velocity, considering the dispersion coefficient as a linear function of velocity, was shown to have useful predictive value. (Sims-ISWS)
W77-04769

KINETICS OF CHEMICAL DEGRADATION OF MALATHION IN WATER,
Environmental Research Lab., Athens, Ga.
N. L. Wolfe, R. G. Zepp, J. A. Gordon, G. L. Baughman, and D. M. Cline.
Environmental Science and Technology, Vol. 11, No. 1, p 88-93, January, 1977. 5 fig, 19 ref, 4 tab.

Descriptors: *Insecticides, *Phosphothioate, *Chemical degradation, *Kinetics, Organophosphorus compounds, Water pollution sources, Degradation(Decomposition), Oxidation, Phosphorus compounds, Sulfur compounds.
Identifiers: *Malathion, Photolysis.

Acid degradation of malathion, O,O-dimethyl-S-(1,2-dicarbethosy)ethyl phosphorodithioate, is too slow to be important under environmental reaction conditions. However, alkaline degradation is fast enough to be a competitive degradation pathway in the environment. The products of alkaline degradation are temperature dependent. Oxidation by molecular oxygen is too slow under acidic conditions to be a degradation pathway. Photolysis is slow in distilled water but may be important in natural waters. (Witt-IPC)
W77-04800

SAMPLING DEVICE FOR MONITORING BIODEGRADATION OF OIL AND OTHER POLLUTANTS IN AQUATIC ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, and R. R. Colwell.
Environmental Science and Technology, Vol. 11, No. 1, p 93-95, January, 1977. 1 fig, 5 ref, 5 tab.

Descriptors: *Biodegradation, *Oil wastes, *Aquatic environment, *Organic compounds, *Oil, Instrumentation, Pollutants, Water pollution sources, Industrial wastes, Bacteria, Water temperature, Water pollution, Monitoring, Water analysis.

An inexpensive, easy to assemble, and simple to use sampling device was designed and constructed to study the fate of oil in the aquatic environment. Results of a field study showed that 97% of the crude oil placed in the sampling chamber was removed after in situ incubation for four weeks during which the water temperature was 30 plus or minus 2C. Decrease of the oil was accompanied by an increase in the total aerobic, heterotrophic microbial population. A proportional increase in petroleum-degrading and lipolytic bacteria was noted and was accompanied by a decrease in the amylolytic bacterial population. Results suggest that bacteria play a significant role in the biodegradation of oil in the natural environment. (Witt-IPC)
W77-04801

ENVIRONMENTAL CONCERNS OF (SWEDISH) WOOD-PROCESSING INDUSTRIES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5G.
W77-04828

OCEANOGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT: DATA REPORT FOR R.V. EASTWARD CRUISES E-3-74 (24-30 APRIL 1974) AND E-12-74 (23-31 JULY 1974),
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W77-04835

HYDROGRAPHY OF ONSLOW BAY, NORTH CAROLINA: SEPTEMBER 1975 (OBIS II),
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W77-04837

DOCUMENTATION OF FOUR OCEAN-RELATED COMPUTER MODULES,
Massachusetts Inst. of Technology, Cambridge. Dept. of Ocean Engineering.
R. W. Young.
Sea Grant Program Technical Report No. MITSG 76-18, Index No. 76-318-Nbc, November 1976. 71 p, 3 ref. SG-04-6-158-44007.

Descriptors: *Computer models, *Computer programs, *Oil spills, *Oil pollution, *Water pollution sources, Tidal effects, Water resources, Path of pollutants.
Identifiers: *Tidal currents, Oil spill tracking.

Documentation is presented of a series of ocean-related computer programs developed recently at MIT. The first program MCTRAJ is the offshore oil-spill trajectory-simulation program which is based on a trajectory equation. The current is treated as a non-random quantity which could be assigned direction and speed as a function of the geographical location. Tidal variations are not included. T14TRAN is a program which takes as input formatted data tape prepared by the National Climatic Center and generates as output the resultant probabilistic wind transition matrices to be used by the offshore (MCTRAJ) and onshore (NEARSHORE) spill-tracking programs. NEARSHORE is the nearshore oil-spill tracking-simulation program based on a trajectory equation. This is the same equation used by Program MCTRAJ except it allows the specification of an additional component corresponding to the presence of tidal current. TWOFOIL is a program which seeks the solution of the two-dimensional lifting flow about two symmetric bodies. An extension of the Ryan-Glover technique of vortex-distribution is used to solve the coupled integral equations. (NOAA)
W77-04838

ONSLOW BAY INTRUSION STUDY: HYDROGRAPHIC OBSERVATIONS DURING CURRENT METER SERVICING CRUISES IN AUGUST, OCTOBER, AND DECEMBER 1975 OBIS I, III AND IV,
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W77-04839

PETROLEUM IDENTIFICATION BY LASER RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-04843

WASTE DISPOSAL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5E.
W77-04847

MICROBIAL ALKYLATION OF METALS,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5C.
W77-04859

ECOLOGICAL SIGNIFICANCE OF WATER TURBIDITY EXEMPLIFIED BY PONDS OF THE NORTH CAUCASUS, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Inst. of Lakes-Keeping.
T. D. Slepukhina.
Ekologiya 6(5), p 94-96, 1975.

Descriptors: *Ponds, *Ecological distribution, Silt, *Turbidity, Biomass, Diptera, Oligochaetes, Data collections, *Benthos.
Identifiers: *USSR(North Caucasus).

Data are presented on 82 water bodies of the North Caucasus (USSR) with a water transparency not exceeding 20-25 cm with respect to a white disc. In 19 ponds the average abundance of benthos was less than 400 specimens/m2 and the average biomass less than 0.5 g/m2; in 24 ponds, 400-1000 specimens/m2 respectively; in 39 ponds, 1000-32000 specimens/m2 and 10-150 g/m2. An analysis of variance established that water turbidity affects the species diversity of benthos and that the abundance and biomass of the benthos are related to the degree of siltation of the pond. The greater the layer of silt, the higher the level of development of pelophilic organisms (chironomids and oligochaetes).--Copyright 1976, Biological Abstracts, Inc.
W77-04861

SOLUBILITY OF OXYGEN IN WATER, SATURATION VALUES FOR FRESH WATER AND MIXTURES OF FRESH AND SEA WATER,
Nipak, Inc., Pryor, Okla.
W. Sisson.
Pollution Engineering, Vol. 7, No. 22, p. 38-39, 1976. 1 fig.

Descriptors: *Dissolved oxygen, *Graphical analysis, Oxygen, *Solubility, Measurement, Saturation, Atmospheric pressure, Temperature, Sea water, Freshwater, Chlorides, Oxygen sag, Graphical methods, Physical properties, Water chemistry.
Identifiers: *Nomographs.

A method of graphical analysis is illustrated for estimating amounts of dissolved oxygen under varying conditions of salinity, physical properties and water chemistry. The amount of oxygen taken up by water from the atmosphere is dependent upon temperature, barometric pressure and the amount of chloride in the water. Oxygen soubility is less in water containing chloride than in fresh water; thus the amount of oxygen dissolved by sea water (containing 20,000 ppm chloride) in equilibrium with air is only about 80% of that taken up by fresh water. Oxygen saturation values are expressed in the gravimetric unit, mg/1, or its equivalent, ppm. Saturation values may also be expressed in the unit 'pounds/day in a flow of 1 cu ft/sec, ' which are multiplied by the stream-flow in cu ft/sec to give the total oxygen passing a given point in lbs/day. The nomograph gives the solubility of oxygen in water in equilbrium with air various barometric pressure, temperatures and salinities. The graph provides the findings of dissolved oxygen in fresh water in ppm, m1/1 day/cu ft sec flow, and for saline waters in ppm and m1/1. (Auen-Wisconsin).
W77-04864

THE DRIFT AND ITS ECOLOGICAL SIGNIFICANCE: EXPERIMENTAL INVESTIGATION ON ECDYONURUS VENOSUS (FABR.) IN A STREAM MODEL, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
A. Keller.
Schweiz Z Hydrol 37(2), 294-331, 1975.

Descriptors: *Aquatic drift, *Larvae, *Ecological distribution, *Model studies, Oxygen, Periphyton, Streams, Temperature, Littoral drift.
Identifiers: *Ecdyonurus-venosus, Larval instar.

Using 1-factor experiments, the drift of larvae of E. venosus was analyzed in a stream model. The distances traveled by drifting animals as a function of water velocity have been determined, as well as some drift rhythms. Drift-inducing factors are scarcity of food (lack of periphyton) and movement of substrate. Induction of drift by low water velocities can be caused by insufficient O2 supply. The typical drift minimum during the final larval instar is said to be caused by a pseudo-pupal stage. After temperature shocks of plus or minus 5C, respectively, the animals acclimate within 2 days. An increase in temperature induces a decrease in drift rates and vice versa. Sex, predation and competion do not influence drift. The mean flight range of the imagoes (flight mill) is 2794 m, the maximum upstream movement of the larvae 140 m/24 h.--Copyright 1976, Biological Abstracts, Inc.
W77-04865

ORGANIC LEACHATE THREATENS GROUNDWATER QUALITY,
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
J. M. Robertson.
Water and Sewage Works, Vol 123, No 2, p 58-59, 1976. 1 tab, 16 ref.

Descriptors: *Groundwater, *Leachate, *Organic compounds, Polychlorinated biphenyls, Plastics, Garbage dumps, Oklahoma, Pollutants, *Landfills, Water quality, Water pollution.
Identifiers: Phthalate esters, Norman(Okla), *Organic leachate.

Samples from three groundwater test wells adjacent to a landfill site near Norman, Oklahoma, were compared with samples from a nearby control well and analyzed for groundwater pollutants, with emphasis on PCBs and phthalate esters. Groundwater was sampled by modified low-carbon adsorption procedures incorporating an all glass-teflon system to preclude introduction of extraneous organics. Column chromatography, solubility separation and gas chromatography-mass spectrometry were employed for separation, idenfication and quantification of individual compounds in organic extracts. Results indicated that more than five kinds of esters of phthalic acid existed in groundwater. Three of them were diethyl phthalate (4.1 microgram/1), disobutyl phthalate (0.1 microgram/1) and dioctyl phthalate (2.4 microgram/1). Also tentatively identified were di-n-butyl phthalate, butylcarbobytoxymethyl phthalate, and dicoyclohexyl phthalate. The source of these compounds was apparently manufactured products discarded in the landfill which leached to the aquifers through slow decay. There was no evidence of PCBs in groundwater. It is probable that PCBs are insoluble and could be largely adsorbed on soil particles. within a short distance of the point of deposition. The undetectable amount of PCBs in groundwater was not significant to the water supply but it would undoubtedly affect the terrestrial ecosystem. The sources, characteristics, and commercial uses of PCBs and phthalate esters are discussed as well as their pathological potential via bioaccumulation through food chains. (Auen-Wisconsin)
W77-04870

THE SORPTION OF IODATE AND IODIDE BY RIVERINE SEDIMENTS: ITS IMPLICATIONS TO DILUTION GAUGING AND HYDROCHEMISTRY OF IODINE,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2K.
W77-04874

ON THE PRECISION OF SALT DILUTION GAUGING,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2E.
W77-04875

MOVEMENT OF POLLUTANTS IN A TWO-DIMENSIONAL SEEPAGE FLOWFIELD,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
T. S. Nishi, J. C. Bruch, Jr., and R. W. Lewis.
Journal of Hydrology, Vol 31, No 3/4, p 307-321, December 1976. 2 fig, 12 ref. NSF GK-42356, UCAL-WRC-W-428.

Descriptors: *Path of pollutants, *Dispersion, *Waste dilution, *Seepage, *Model studies, *Pollutants, Groundwater movement, Equations, Mathematical studies, Mathematical models, Analytical techniques, *Finite element analysis, Dispersion, Infiltration, Channels, Hydrodynamics, Porous media.

Hydrodynamic dispersion in seepage from a triangular channel was considered. The finite-element method, using isoparametric elements, was employed to solve this two-dimensional anisotropic convection-dispersion problem. Included were comparisons between finite-elements and finite-difference solutions to this problem. (Sims-ISWS)
W77-04876

QUANTIFYING THE NATURAL FLUSHOUT OF ALLUVIAL AQUIFERS,
Engineering Enterprises, Inc., Norman, Okla.
J. S. Fryberger, and W. H. Bellis.
Ground Water, Vol. 15, No. 1, p 58-65, January-February 1977. 6 fig, 7 ref.

Descriptors: *Alluvial aquifers, *Groundwater, *Water pollution, *Model studies, Mathematical models, Water quality, Salinity, Salts, Precipitation(Atmospheric), Flow, Groundwater movement, Base flow, Alluvium, Evapotranspiration, Evaporation, Pollutants, Path of pollutants, Forecasting, Pollution.
Identifiers: *Natural flushout.

A plume of contaminated water may extend downstream for several miles in an alluvial aquifer. Hydrologic forces acting on the aquifer generally tend to dilute the contaminant downstream from the source. After the pollution has been stopped, how rapidly will these hydrologic forces flush out the contaminant. The answer to this question may be calculated by using the mass-balance equation herein developed. This described mass-balance mathematical model incorporates all the hydrologic forces acting on the alluvial aquifer that affect the concentration of the contaminant. Methods were presented to define and quantify each of the hydrologic forces. These forces include: (1) present quantity and quality (with respect to contaminant) of water in the alluvium and the change in the quality downstream, (2) quantity and quality of groundwater inflow, (3) quantity and quality of flood inflow, (4) quantity and quality of base flow, (5) quantity of recharge from precipitation, and (6) quantity of loss from evapotranspiration. The equation was first balanced to agree with past conditions and observed field data, and it was then used to predict future quality changes after the pollution is stopped. The method is applicable primarily to situations in which the pollution has been taking place over a long period of time and the water quality in the alluvium has reached equilibrium at any given point. Modifications may be possible to permit use of the general approach to short-term of slug-type pollution events. (Sims-ISWS)
W77-04889

IMPROVING THE SANITARY PROTECTION OF GROUND WATER IN SEVERELY FOLDED, FRACTURED, AND CREVICED LIMESTONE,
Agricultural Research Service, Beltsville, Md.
E. E. Jones, Jr., and C. M. Murray.
Ground Water, Vol. 15, No. 1, p 66-74, January-February 1977. 9 fig, 2 tab, 8 ref.

Descriptors: *Water wells, *Water pollution, *Limestones, *Maryland, Wells, Filtration, Pollutants, Bacteria, Coliforms, Path of pollutants, Groundwater, Sediments, Fractures(Geologic), Groundwater movement, Water levels, On-site investigations, Well data, Water quality.
Identifiers: *Tropical storm Agnes, Creviced limestones, Well reconstruction.

The construction of wells yielding safe, sanitary water in areas of severely folded, fractured, and creviced limestone depends on the retention of enough sediment in the transmission paths to restrict the movement of contaminants. The described research was directed towards two problems, (1) the identification of terrain and hydrologic features that indicate a lack of adequate sanitary protection of grounwater in the formation, (2)means of improving this protection. Intermittent spring-sinks along streams or in low-lying areas indicate a reversal of groundwater flow in the area. When the water level rises above a critical level, sediments that have accumulated in the formation over many years may be discharges in a few days, resulting in a loss of filtering ability. Groundwater levels and bacteriological contamination were monitored in four wells in Washington County, Maryland, since 1973. Groundwater quality deteriorated after tropical storm Agnes washed sediments from the formation. Techniques for preventing surface contaminant entry, improving filtering ability of the formation, and providing controlled relief of hydrostatic pressure were studied as ways of protecting groundwater in the formation. (Sims-ISWS)
W77-04890

LAND AND WATER USE IMPACTS ON GROUND-WATER QUALITY IN LAS VEGAS VALLEY,
Office of Radiation Programs. Las Vegas, Nev.
R. F. Kaufmann.
Ground Water, Vol. 15, No. 1, p 81-89, January-February 1977. 9 fig, 11 ref. EPA R800946.

Descriptors: *Groundwater, *Water quality, *Irrigation, *Nevada, Chlorides, Dissolved solids, Nitrates, Tracers, Tritium, Aquifers, Aquitards, Pollution, Water pollution, Pollutants, Sewage effluents, Path of pollutants, Groundwater recharge, Irrigation efficiency, Land use, Water demand, Water utilization.
Identifiers: *Las Vegas(Nev), *Las Vegas Valley(Nev).

Marked changes in the occurrence and quality of near-surface groundwater in Las Vegas Valley, Nevada, result from urban and industrial land and water use practices. In-valley recharge has increased tenfold in the period 1943 to 1973, and it now amounts to about 40,000 acre-feet/year (49.3 million cu m). Groundwater flows leaving the Valley have increased from 250 acre-feet/year to about 12,000 acre-feet/year. Twenty to 400 tritium units (T.U.) in shallow groundwater confirm widespread addition of recent recharge. Trend-surface analysis of recent water quality data for depth intervals or 'slices' of 0 to 50, 51 to 100, and 101 to 300 feet (0 to 15.2 m, to 39.5 m, 30.8 to 91.4 m) revealed that natural trends below a depth of 50 feet are explainable in terms of broad hydrogeologic conditions. From 0 to 50 feet, quality is highly irregular and markedly more influenced by land and water use practices, and waste disposal in particular. Chloride, TDS, and nitrate are particularly diagnostic of return flows as is spring development and/or a rising water table resulting from increased recharge and low vertical permeability. Statistical tests on water quality data for the period 1912 to 1968 yielded generally insignificant change with time However, the paucity of the data base makes any conclusion questionable. More efficient irrigation practices could reduce the present irrigation water demand by 15,000 acre-feet/year and reduce return flows by 11,000 acre-feet/year. Return flows by the year 2000 could easily amount to 75,000 acre-Feet/year, or about three time the total water budget of the Valley prior to urbanization. Therefore, groundwater problems are likely to worsen and, if present monitoring practices prevail, go unnoticed. (Sims-ISWS)
W77-04891

SOME REMARKS ON COMPUTER MODELING OF COASTAL FLOWS,
California Univ., Berkeley. Dept of Civil Engineering.

Descriptors: *Coastal engineering, *Computer models, *Dispersion, *Estuaries, Stratified flow, Turbulence, Mixing, Circulation, Wind velocity, Data collections, Model studies, Equations, Mathematical studies, *Path of pollutants.
Identifiers: *Navier-Stokes equation, Overmixing, Wind stress coefficient.

Limitations on ability of numerical models to model flow and dispersion of pollutants in coastal areas due to fundamental limitations in knowledge of exchange coefficients were discussed. Some voids in fundamental understanding of nature were identified, such as incomplete understanding of the action of control sections on stratified flows, only a qualitative and approximate understanding of the effect of stratificaion of the water coolumn on the turbulent mixing of mass and momentum, lack of accurate procedures for estimating horizontal diffusivities of mass and momentum in the wide flows typical of coastal areas, and difficulty in estimating the wind stress coefficient for satisfactory modeling of wind-driven circulations. Despite these limitations, it is possible to make models that average over space and time and that include sufficient empirical input so that the essential physical processes are preserved and the model results are sufficiently accurate for the intended purposes. Individual models must be tailored to individual problems with due regard to controlling physical processes and the intended application of results. (Singh-ISWS)
W77-04897

POTENTIAL POWER-GENERATING STATIONS ON THE ATLANTIC CONTINENTAL SHELF,
Public Service Electric and Gas Co., Newark, N. J.
For primary bibliographic entry see Field 6G.
W77-04935

AN INTRODUCTION TO SHEAR FLOW DISPERSION AND ITS RELEVANCE TO DISPERSION ON THE CONTINENTAL SHELF,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Fischer.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 61-63, June 1976. 8 ref.

Descriptors: *Turbulent flow, *Resources development, *Baseline studies, Continental shelf, *Dispersion, Shear, Path of pollutants.
Identifiers: *Outer Continental Shelf, *Energy resources, Environmental conditions *Shear flow dispersion.

The purpose of this paper is to introduce the shear effect, to describe how shear flow dispersion occurs in rivers and estuaries, and to offer some thoughts on why the process is important on the continental shelf. It seems apparent that shear flow dispersion is an important mechanism on the shelf and that those working on shelf studies ought to be familiar with it. Application of the shear-effect analysis to dispersion on the shelf requires two types of data. First, it is essential to know the distribution of velocity, in both time and space, because the advective velocity is the primary determinant of where a pollutant will go. Second, the rate of turbulent diffusion between streamlines must be known because this rate determines how much of a diffusing cloud will migrate from streamlines of one velocity and direction to streamlines of another. With sufficient data it is relatively simple to construct a numerical model of dispersion and pollutant transport. (See also W77-04934) (Sinha-OEIS)
W77-04939

REVIEW OF OIL SPREADING ON THE SEA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
D. P. Hoult.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 64-69, June 1976. 20 ref.

Descriptors: *Oil spills, *Oil pollution, *Resources development, *Water pollution effects, *Baseline studies, Continental shelf, Hazards, Path of pollutants.
Identifiers: *Outer Continental Shelf, *Energy resources, Environmental factors, Oil slicks, Oil spreading.

The phenomena dealt with in gaining an understanding of oil spread include the inertia and buoyancy of the oil and the drag of the water under the oil slick. These factors influence the rate at which an oil spill initially spreads and the effect of currents on its drift. Surface tension controls the rate at which some oil slicks become thin films, as well as the formation of droplets. The different boiling-point fractions found in most oils determine, in part, the rate of aging of spilled oil and perhaps the surface tension of various fractions. Finally, the drift of oil slicks is controlled by the complex interaction of wind, waves, currents, and the properties of the oil slick. (See also W77-04934) (Sinha-OEIS)
W77-04940

PLANKTON PROCESSES IN MID-ATLANTIC NEARSHORE AND SHELF WATERS AND ENERGY-RELATED ACTIVITIES,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04941

PETROLEUM, TEMPERATURE, AND TOXICANTS: EXAMPLES OF SUSPECTED RESPONSES BY PLANKTON AND BENTHOS ON THE CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04942

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENTS,
State Univ., of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W77-04948

NUMERICAL MODEL OF THE SALT-WEDGE REACH OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
E. A. Prych, W. L. Haushild, and J. D. Stoner.
Available from Supt. of Documents, GPO, Wash., D. C. 20402. Price $1.05. Professional Paper 990, 1976. 34 p, 29 fig, 13 tab, 53 ref.

Descriptors: *Model studies, *Saline water intrusion, *Estuaries, *Numerical analysis, Water temperature, Chlorophyll, Biochemical oxygen demand, Dissolved oxygen, Phytoplankton, Sewage effluents, Evaluation, Data collections, *Washington.
Identifiers: *Duwamish River estuary(Wash).

A numerical model of a salt-wedge estuary developed by Fischer (1974) has been expanded and used to calculate the distributions of salinity, temperature, chlorophyll a concentration, biochemical oxygen demand, and dissolved-oxygen concentration in the Duwamish River estuary, King County, Wash. The model was used to predict the dissolved-oxygen concentrations in the Duwamish River estuary when the Renton Treatment Plant sewage-effluent discharge is increased to its proposed maximum of 223 cubic feet per second. The computed monthly average dissolved-oxygen concentrations in the estuary decreased by a maximum of 2 milligrams per liter when compared with computations for the summer of 1971, when the effluent discharge averaged 37 cubic feet per second. The increase in effluent discharge is not expected to cause large changes in phytoplankton concentrations in the estuary. (Woodard-USGS)
W77-04973

SALINE WATER IN THE LITTLE ARKANSAS RIVER BASIN AREA, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans. Water Resources Div.
R. B. Leonard, and M. K. Kleinschmidt.
Kansas Geological Survey, Lawrence, Chemical Quality Series No 3, September 1976. 24 p, 16 fig, 5 plates, 4 tab, 14 ref.

Descriptors: *Water pollution sources, *Oil fields, *Brine disposal, *Underground waste disposal, *Kansas, Groundwater movement, Hydrogeology, Geochemistry, Subsidence, *Saline water, Path of pollutants.
Identifiers: *Little Arkansas River basin, South-Central Kansas.

Ground water in unconsolidated deposits of Pleistocene age in part of the Little Arkansas

River basin in Kansas has been polluted by the influx of saline water. The source of the saline water generally is oil-field brine that leaked from disposal ponds on the land surface. Locally, pollution by saline water also has been caused by upwelling of oil-field brine injected under pressure into the 'lost-circulation zone' of the Lower Permian Wellington Formation and, possibly, by leakage of brine from corroded or improperly cased disposal wells. Anomalously high concentrations of chloride ion in some reaches of the Little Arkansas River probably can be attributed to pollution by municipal wastes rather than from inflow of saline ground water. (Woodard-USGS)
W77-04979

RECONNAISSANCE WATER SAMPLING FOR RADIUM-226 IN CENTRAL AND NORTHERN FLORIDA, DECEMBER 1974--MARCH 1976,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-04983

GRAPHIC AND ANALYTICAL METHODS FOR ASSESSMENT OF STREAM-WATER QUALITY--MISSISSIPPI RIVER IN THE MINNEAPOLIS-ST PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-04984

OUTDOOR RECREATION IN WATERSHED RESERVES,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-04996

DISTRIBUTION AND EFFECTS OF HEAVY METALS IN A CONTAMINATED LAKE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W77-05001

NITROGEN AND METAL CONTAMINATION OF NATURAL WATERS FROM SEWAGE SLUDGE DISPOSAL ON LAND,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
L. E. Sommers, D. W. Nelson, R. E. Terry, and D. J. Silviera.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 089, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 89, December 1976. 103 p, 35 fig, 51 tab, 54 ref. OWRT B-066-IND(1).

Descriptors: *Sludge disposal, *Heavy metals, *Nitrates, *Water pollution, Sulfur compounds, Sewage sludge, Waste water disposal, Sewage disposal, *Path of pollutants, Soil disposal fields, *Nitrogen, Model studies, Groundwater movement.
Identifiers: *Land disposal, Nitrogen transformations, Carbon transformations.

The studies evaluated (1) the chemical composition of sewage sludges, (2) the mobility of sludge constituents in soil columns, and (3) the use of synthetic sludges as a model system in studying the dynamics of carbon and nitrogen in soils amended with sewage sludges. The chemical composition of sewage sludges varied considerably. Where industry wastes were treated, heavy metals were usually present. The forms of sulfur were markedly different depending upon the source of sludge and the time of sample collection. Intact soil cores were utilized to evaluate the transformation of C, N, and metals. For the majority of the soils and sludges examined, the amount of nitrate leached from sludge amended columns was less than or equal to the amount of nitrate from columns not treated with sludge. The movement of metals in sludge amended soils after one year incubation was minimal below 1 - 7.5 cm. Studies using C14 labeled synthetic sludges indicated that current estimates of sludge decomposition based on organic C in sludge-treated and non-treated soil may be invalid. A model is presented depicting the chemical and physical factors responsible for the movement of nitrogen and metals into ground water following sludge disposal on land. (Wiersma-Purdue)
W77-05002

IMPROVED WASTE-TREATMENT SYSTEMS DESIGN BASED ON THE NATURAL THERMAL ENVIRONMENT,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W77-05004

TOWARD SIMULATION AND SYSTEMS ANALYSIS OF NUTRIENT CYCLING IN THE OKEFENOKEE SWAMP, GEORGIA,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
E. J. Rykiel, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 045, Price codes: A08 in paper copy, A01 in microfiche. Georgia Institute of Technology, Atlanta, Environmental Resources Center, Report No. ERC-01-77, January, 1977, 139 p, 25 fig, 40 tab. OWRT A-060-GA(1), 14-31-0001-5010.

Descriptors: Hydrology, *Georgia, *Cycling nutrients, *Simulation analysis, *Systems analysis, *Swamps, Wetlands, Water quality, Streamflow, Chemistry of precipitation, Potassium.
Identifiers: *Okefenokee Swamp(Geo), *Nutrient budget.

The Okefenokee Swamp is a dominant part of the source watershed of the upper Suwannee River and the north prong of the St. Mary's River. The Swamp determines water quality in the upper reaches of these rivers. Very little previous study has been made of hydrology of the Okefenokee basin or of processes determining water quality. This report provides the presently known details of the hydrology, and of the chemistry of precipitation, streamflow, swamp surface water and groundwater for five major elements. Evidence is presented that: (1) precipitation is the major source of nutrients; (2) potassium is a potentially limiting element; (3) the chemical composition of streamflow is virtually identical to swamp surface water; (4) nutrient budgets are nearly balanced with the exception of chloride; (5) measured concentration of elements cannot be accounted for simply by concentration due to evapotranspiration; and (6) biological processes alter the chemical composition of swamp water, even in regard to major elements which are in short supply. A systems approach is necessary in order to understand cycling of nutrients in Okefenokee Swamp.
W77-05005

NON-POINT SOURCES OF WATER POLLUTION.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 090, Price codes: A14 in paper copy, A01 in microfiche. Proceedings of Southeastern Regional Conference Conducted on May 1 and 2, 1975, in Blacksburg, Virginia at VPI. Published September 1975. 314 p. Ashton, Peter M. and Underwood, Richard C., Editors.

Descriptors: *Path of pollutants, Water pollution control, *Pollutant identification, Runoff, Turbidity, Runoff coefficient, *Urban runoff, *Mine drainage, *Water pollution sources, Erosion, Combined sewers, Sediments, Coliforms, Pesticides, *Agricultural runoff, Farm wastes, Nutrients, Agricultural chemicals, *Strip mining, Land reclamation, Heavy metals, Southeastern U.S., *Sediment yield, Construction, Biochemical oxygen demand, Forest management.
Identifiers: Housing, Universal soil loss equation, *Non-point water pollution sources.

The 1975 conference was sponsored by the Virginia Water Resources Research Center in cooperation with the U.S. Office of Water Research and Technology, EPA Regions III and IV, and Virginia Polytechnic Institute and State University. Purposes included the transfer of research findings and methodologies to user groups, and researcher-user discussion of knowledge gaps and research needs. Included are 21 major papers, extensively footnoted and with numerous figures and tables. Five papers provide overview and state-of-the-arts review. Thirteen papers give specific reports on research, case studies, and examples in the four principle source areas from which water pollution originates: (1) agricultural and rural; (2) forestry; (3) urban and construction, and (4) mining and mineral extraction. A concluding section includes three papers that discuss control remedies, policies, and programs. Throughout, a common point of reference is the Federal Water Pollution Control Act Amendments of 1972, and in particular Section 304(e) of that legislation. An appendix contains a complete list of the names and addresses of conference registrants and speakers.
W77-05007

SURFACE-WATER QUALITY MANAGEMENT MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-05014

ESTUARIAL MODELS,
Resource Management Associates, Lafayette, Calif.
For primary bibliographic entry see Field 2L.
W77-05015

ECOLOGIC MODELS,
Manhattan College, Bronx, N.Y. Environmental Engineering and Science Program.
D. J. O'Connor, R. V. Thomann, and D. M. Di Toro.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 294-334 (Chapter 8), McGraw-Hill, New York, N.Y., 1976. 11 fig, 4 tab, 27 ref.

Descriptors: *Ecology, *Water quality control, *Water management(Applied), *Nitrification, *Simulation analysis, Streams, Estuaries, Delaware River, Kinetics, Biochemical oxygen demand, Ecosystems, Temperature, Effects, Dissolved oxygen, Aquatic environment, Denitrification, Equations, *Mathematical models, Systems analysis.
Identifiers: Potomac River, Monod equation, Growth equation, Sequential reaction model, Feedback model, Linear model, Nonlinear model.

Presented is a simplified ecologic model having general applicability to water-quality conditions in one-dimensional natural water systems such as streams and estuaries. In order to demonstrate the significance of these models and their utility in the analysis of water pollution control programs, application is made to the nitrification process in estuaries of the delaware and Potomac Rivers. Ecologic models in the context of this chapter are considered to be analytical structures of broad

segments of the aquatic ecosystem. Specific attention is directed to a linear model of nitrification in the analysis of the dissolved oxygen in natural water systems. A nonlinear model is first presented, and a linear approximation is shown to be justified under conditions encountered in the natural systems reviewed herein. The models presented progress from relatively simple nitrogen-equivalent biochemical oxygen demand models to more complex models which incorporated feedback effects. Applications of the steady-state first-order kinetic models to the Delaware and Potomac estuaries among others indicate that the broad features of nitrification and associated oxygen demand can be approximated. (See also W77-05008) (Bell-Cornell)
W77-05016

SOME BIOCHEMICAL CHARACTERISTICS OF THE WATER IN THE CARIACO TRENCH, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-05021

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1975 - OCTOBER 1975,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, and R. M. Ross.
U.S. Environmental Protection Agency Environmental Protection Technology Series No. EPA-600/2-76-113, July 1976. 310 p. Grant R803063.

Descriptors: *Oil pollution, *Oil spills, *Patents, *Water pollution effects, Documentation, Bibliographies.
Identifiers: *Outer Continental Shelf.

The August 1975 - October 1975 Oil Spill and Oil Pollution Reports is the fifth quarterly compilation of oil pollution report summaries. The following topics are included in the report: Summaries and bibliographic literature citations; Current status of some of the research projects listed in previous reports; Summaries of additional current research projects; Patent summaries; and Current oil-related conferences. (Sinha-OEIS)
W77-05023

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., P. Melvin, and R. M. Ross.
U.S. Environmental Protection Agency Environmental Protection Technology Series No. EPA-600/2-76-129, July 1976. 325 p. Grant No. R803063.

Descriptors: *Oil pollution, *Oil spills, *Patents, *Water pollution effects, Documentation, Bibliographies, Research and development.
Identifiers: *Outer Continental Shelf.

The May 1975 - July 2975 Oil Spill and Oil Pollution Reports is the fourth quarterly compilation of oil pollution report summaries. The following topics are included in the report: Summaries and bibliographic literature citations; Current status of some of the research projects as listed in previous reports; Summaries of additional current research projects; and Patent summaries. (Sinha-OEIS)
W77-05024

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1975 - JANUARY 1976,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, and R. M. Ross.
U.S. Environmental Protection Agency Environmental Protection Technology Series No. EPA-600/2-76-185, July 1976. 364 p. Grant No. R803992.

Descriptors: *Oil pollution, *Oil spills, *Patents, *Water pollution effects, Documentation, Bibliographies, Research and development.
Identifiers: *Outer Continental Shelf.

The November 1975 - January 1976 Oil Spill and Oil Pollution Reports is the sixth quarterly compilation of oil pollution report summaries. The following topics are included in the report: Bibliographic literature citations, article summaries, and tabulated information on polluting incidents in and around U.S. waters; Current status of some of the research projects listed in previous reports; Summaries of additional current research projects; Patent summaries; and Current oil-related conferences. (Sinha-OEIS)
W77-05025

OIL SPILL AND OIL POLLUTION REPORTS FEBRUARY 1976 - APRIL 1976,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, R. M. Ross, and H. Ehrenspeck.
U.S. Environmental Protection Agency Environmental Protection Technology Series No. EPA-600/2-76-215, August 1976. 317 p. Grant R803992.

Descriptors: *Oil pollution, *Oil spills, *Patents, *Water pollution effects, Documentation, Bibliographies, Research and development.
Identifiers: *Outer Continental Shelf.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject scope includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and documents selected from the scientific and technical literature during the period February 1976 through April 1976. The following sections are included in the report: I. Reports, Publications, and Patents; II. Current Research Projects; and III. Current Oil-Related Conferences. (Sinha-OEIS)
W77-05026

5C. Effects Of Pollution

EFFECTS OF AGRICULTURAL LAND USES ON RUNOFF QUALITY.
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
J. I. Sewell, and J. M. Alphin.
Animal Waste Management Facilities and Systems, Bulletin 548, University of Tennessee, Agricultural Experiment Station, July, 1975, p. 44-46. 1 tab, 19 ref.

Descriptors: *Agricultural runoff, *Land use, *Water pollution, *Tennessee, *Bacteria, *Biochemical oxygen demand, *Dissolved oxygen, *Nitrates, Agriculture, Water quality, Coliforms, Phosphates, *Farm wastes.
Identifiers: *Orthophosphates.

Twenty-four test sites from 5 locations and representing much of Tennessee's agriculture were selected for study. The purpose was to evaluate the effect of several agricultural land uses on surface runoff quality near the areas of study. Grab samples were collected 4 to 10 times from each site. Bacterial cultures were made for both total and fecal coliform counts. Biochemical oxygen demand and dissolved oxygen tests were conducted. Also nitrate-nitrogen and orthophosphate sample concentrations were determined. Concentrations of livestock increased the biochemical oxygen demand, orthophosphates, and bacterial counts of samples collected from nearby steams. Of 13 sites examined on flowing streams, none had dissolved oxygen or nitrate-nitrogen levels which failed to meet EPA standards; and only failed to meet the bacterial count criteria. (Rowe-East Central)
W77-04612

FISHERY MANAGEMENT IN A MEROMICTIC ALPINE LAKE (LAKE CADAGNO, TICINO), (IN GERMAN),
Eidgenoessisches Amt fuer Umweltschutz, Bern (Switzerland).
For primary bibliographic entry see Field 2H.
W77-04627

EFFECT OF HIGHLY MINERALIZED MINE WATERS ON FISH FAUNA OF WATER BODIES OF THE STEPPE ZONE OF THE UKRAINIAN SSR, (IN RUSSIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Inst. of Hydrobiology.
S. P. Fedii.
Vopr Ikhtiol 15(5), p 939-940, 1975.

Descriptors: *Mine water, *Mineralogy, Streams, Fish, Water pollution effects, Dehydration, Biochemistry.
Identifiers: *Ukrainian-SSR, USSR.

Investigations estsablished that highly mineralized mine waters entering streams have an unfavorable effect on fish fauna of the steppe zone f the Ukrainian SSR (USSR), changing the species composition toward an increase of trash fish and a decrease of commercial fish and affecting the biochemieal composition of the fish; fat concent decreases, total mineral substances increases and signs of dehydration of the tissues appear.--Copyright 1976, Biological Abstracts, Inc.
W77-04721

THE PROLIFERATION IN THE SEINE OF A TROPICAL BENTHIC DIATOM: NAVICULA CONFERVACEA (KUTZ.), (IN FRENCH),
Centre Technique du Genie Rural, des Eaux et des Forets, Besancon (France). Lab. of Hydroecology.
M. Coste.
Ann Limnol 11(2), p 111-123, 1975.

Descriptors: *Diatoms, Aquatic algae, *Distribution, Benthos, *Thermal pollution, Reproduction, Thermal powerplants, Heated water.
Identifiers: France, *Navicula-confervacea, Seine.

This study of the benthic populations in the Seine (France) was based on more than 250 samples taken at 39 stations regularly distributed between the source and Rouen. It was possible to locate the site of proliferation of a benthic diatom, usually considered as endemic to the tropics. This site was immediately downstream from a thermal power station. The morphology, ultrastructure and geographical distribution of this species are briefly examined. The ecological data and the information in the literature suggests that N. confervacea is a saprophytic species which is resistant to pollution and a stenotherm in hot water (25-31C).--Copyright 1976, Biological Abstracts, Inc.
W77-04726

POTENTIAL EFFECTS OF OIL PRODUCTION ON GEORGES BANK COMMUNITIES: A REVIEW OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR OUTER CONTINENTAL SHELF OIL AND GAS LEASE SALE NO. 42,
Woods Hole Oceanographic Institution, Mass. Seminar in Biological Oceanography.
For primary bibliographic entry see Field 6G.
W77-04834

PETROLEUM, TEMPERATURE, AND TOXICANTS: EXAMPLES OF SUSPECTED RESPONSES BY PLANKTON AND BENTHOS ON THE CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. P. Jeffries, and W. C. Johnson II.

Marine Reprint 69, (1976). 16 p, 2 fig, 5 tab, 34 ref. SG-04p6-158-44002.

Descriptors: New York, *Plankton, *Bcnthos, *Temperature, *Toxicants, Ecology, Fish, *Oil pollution, *Water pollution effects, *Continental shelf, Population, Copepods, Model studies.
Identifiers: *Outer Continental Shelf, *New York Bight.

Gross population changes carefully enumerated over time in natural communities of the New York Bight and neaby areas are examined. From such comparisons a basic appreciation of sensitivity within natural systems can be obtained. It is suggested that for open-coastal areas in the Mid-Atlantic Bight, the direct effect of energy-related activities on copepod populations, by far the major component in the zooplankton, is at present not a concern. Limited, short-term effects are seen only at point discharges. Lasting damage to the benthos, however, is another matter. Experience suggests that on the bottom persistent, small-scale environmental changes have cumulative effects that are enhanced, rather than dissipated as in the plankton, by ecosystem processes. (NOAA)
W77-04844

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART 12: BIOENHANCEMENT STUDIES OF THE RECEIVING WATERS IN OUTER LOS ANGELES HARBOR,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
Sea Grant Program Report No. USC-SG-5-76, December 1976. 284 p. Dorothy F. Soule and Mikihiko Oguri (Eds).

Descriptors: *Flushing, Harbors, *Biota, Ecosystems, *Waste disposal, *Indicator organisms, Circulation, Outfalls, Effluent, Domestic sewage, Benthos, *California, *Bioindicators.
Identifiers: *Los Angeles Harbor(CA), Fish cannery wastes, Natural waste discharges, Bioenhancement.

Field studies indicated that the present state of the harbor is healthy. Rich and diverse biotic elements are supported by the present environmental regime. Episodes of stress, which occurred in earlier years, as indicated by reduced levels of dissolved oxyen, have not been noted since the canneries have instituted improved waste management procedures. Bioenhancement is occurring in outer Los Angeles Harbor, due at least in part to the presence of natural waste effluents. Bioenhancement has been evaluated in terms of numbers of organisms and species diversity of plankton, benthic organisms, and standing crop of fish, as well as in biomass and a number of other factors. Under present conditions, a small zone within approximately 200 feet of the outfalls exists where numbers of species are low. Adjacent to this zone is a zone of enrichment which extends through most of the outer harbor. Beyond that, conditions return to average coastal populations. The regulation of waste loading and control of pollutants in the past six-year period has brought the harbor ecosystem from a depauperate biota to a moderately rich one in the immediate outfalls zone, with a very rich biota in the adjacent outer harbor area. (NOAA)
W77-04849

MICROBIAL ALKYLATION OF METALS,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
A. Jernelov.
Report B 332, September 1976. 26 p. 8 fig., 41 ref.

Descriptors: *Metals, *Microbial degradation, *Biodegradation, Ecology, Synthesis, Neutralization, Arsenic compounds, Metabolism, Biochemistry, Oxidation, Mode of action, Reduction(Chemical), Mercury, Water pollution sources, Toxins, Toxicity.
Identifiers: *Methylation, Selenium, Tellurium, Methyl mercury, *Alkylation.

Degradation of metals by processes of biochemical alkylation have been demonstrated to date on mercury, selenium, tellurium, arsenic and tin; but according to a review of the processes' ecological impacts, ecosystems can only be affected if the alkylated compounds formed by biodegradation persist sufficiently long to reach biologically-active concentrations. Assuming that biological alkylation of methyl-mercury, for example occurs in sediment or on suspended particles in water, certain properties may regulate the ecological importance of alkylation through a kind of biologically-achieved equilibrium between the alkylated and non-alkylated forms of the metal. Transport processes in and out of the place of formation changes this equilibrium. Processes such as water and fat solubility and tendencies toward complex formation with sediment, all affect rates and amounts of concentrations of alkylated metal compounds in sediments. Biochemical alkylation processes, i.e., methylation of selenium, tellurium, arsenic and mercury are reviewed and compared; biological degradation of alkyl-metal compounds is discussed in general terms. The potential for microbial methylation of mercury by fungi and bacteria exists under aerobic as well as anaerobic conditions. Some metal organic compounds rapidly degrade in non-enzymatic processes or through the action of non-specific enzymes; others are highly persistent and are degraded only through specific and slow biochemical processes. (Auen-Wisconsin)
W77-04859

THE BIOLOGICAL IMPORTANCE OF A POLLUTED ESTUARY,
Leeds Univ. (England). Wellcome Marine Lab.
M. A. Kendall.
Effluent and Water Treatment Journal, Vol. 16, No. 7, p. 339-341, 1976. 2 fig., 3 tab., 6 ref.

Descriptors: *Estuaries, *Water pollution effects, *Saline water-freshwater interfaces, Birds, Industrial wastes, Migratory birds, Wading birds, Productivity, Foreign countries, Annelids, Boundary processes, Saline water intrusion.
Identifiers: *Tees estuary(England), Tees River(England).

A study of estuarine bird poulations and food chains demonstrates that the proximity of industrial pollution in an adjacent river does not necessarily lead to formation of a biological desert. Although the Tees River in northern England is heavily polluted by spend industrial acids, cycanides, phenols, other organics, and toxic metal as well as untreated sewage, the muddy areas of the river's estuary, particularly Seal Sands, contain and abundant annelid life which supports huge populations of migratory wildfowl and wading birds. Teesmouth has regularly held a peak popoulation in excess of 20,000 wading birds on a single day and three species, the knot, redshank and sanderling, have been recorded in numbers representing more than 1% of their total European population on a single day. No more than fifteen animal species occur in the muds, most of them small annelids (one million sq m have been recorded in some area) which contribute most to the total biomass of Seal Sands. The reason for this biomass density in view of the heavy pollution is that fresh sea water with only a small quantity of polluted river water reaches the Sands from the estuary at flood tide. (Auen-Wisconsin).
W77-04860

LIGHT EXTINCTION MEASUREMENTS IN THE EXPERIMENTAL LAKES AREA--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W77-04862

COMPARATIVE STUDY OF E. COLI SURVIVAL IN TWO AQUATIC ECOSYSTEMS,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
W. Verstraete, and J. P. Voets.
Water Research, Vol. 10, No. 2, p. 129-136, 1976. 4 fig., 5 tab., 20 ref.

Descriptors: *E. coli, *Viability, *Mortality, *Bacteria, Solar radiation, Water temperature, Water pollution, Europe, *Eutrophication, *Oligotrophy, Biochemical oxygen demand, Coliforms, Water pollution effects, Lakes.
Identifiers: *Lake Coupure(Belgium), *Nationale Watersportbaan George Nachez(Belgium), Bacteriophages.

Survival of E. Coli in two aqutic environments in Belgium was measured in water samples by a test procedure witch facilitates deduction of the effects of various factors upon this coliform's die-off or aftergrowth. Results of the procedure are transformed to a log No/Nt form and expressed as die-off indices. The Nationale Watersportbaan George Nachez is a beta-mesosaprobic lake which receives little or no direct fecal or organic pollution. The Coupure, in contrast, is a beta-polysaprobic biotope constantly polluted with sewae and domestic wastewater. In the Watersportbaan fluctuations in the die-off indices were governed mainly by seasonal variations in insolation and the concomitant changes in pH and temperature. In the Coupure, the indices correlated primarily with solar radiation and temperature and t a minor extent with dissolved oxygen content. Seasonal fluctuations of the indices were much less pronounced in the sludge-water interphases of these biotopes. In the beta-mesosaprobic water, bacterial populations constituted the dominant biological component of the ecosystem. In the beta-polysaprobic biotope however, dieoff was due to the activity of the thermolabile toxins and of bacteriophages. The significance of the biochemical oxygen demand-tolerance limit of aquatic environments with regard to the occurrence of microbial inbalances in discussed. (Auen-Wlisconsin)
W77-04863

SOLUBILITY OF OXYGEN IN WATER, SATURATION VALUES FOR FRESH WATER AND MIXTURES OF FRESH AND SEA WATER,
Nipak, Inc., Pryor, Okla.
For primary bibliographic entry see Field 5B.
W77-04864

COMPARISON OF AEROBIC AND ANAEROBIC METHYLATION OF MERCURIC CHLORIDE BY SAN FRANCISCO BAY SEDIMENTS,
California Univ., Berkeley. Div. of Environmental Health Sciences.
B. H. Olson, and R. C. Cooper.
Water Research, Vol. 10, No. 2, p. 113-116, 1976. 4 fig., 1 tab., 12 ref.

Descriptors: *Mercury, *Degradation(Decomposition), Bays, *Aerobic conditions, *Anaerobic conditions, Bottom sediments, Intertidal areas, *California, Estuaries.
Identifiers: *Methylmercury, *Methylation, *Mercuric chloride, *San Francisco Bay.

Analyses of three sediment types from San Francisco Bay indicated that the net amount of methyl mercury produced under anaerobic conditions was greater than produced under aerobic conditions, with strong evidence that the process is of a biological nature. The sediment containing the highest organic content consistently produced higher levels of methylmercury; relatively more methyl mercury remained in the sediments under anaerobiosis than under oxygenated conditions;--a possible indication that methyl mercury produced in anaerobic sediments is more stable under aerobic conditions. The data indicated that methylation

of mercury appears to proceed at much greater rates in anaerobic sediments than those incubated with access to air. However, the difference in methyl mercury production may be more apparent than real, particularly if demethylating activity is much greater under anaerobiosis. Gross production of methylmercury may be the same under both conditions but an increased methylmercury decay rate in an aerobic environment would cause the net production under anaerobic conditions to be significantly greater. (Auen-Wisconsin)
W77-04867

PHYTOPLANKTON PRIMARY PRODUCTION IN THE EXPERIMENTAL LAKES AREA USING AN INCUBATOR TECHNIQUE--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
D. R. DeClercq, and J. A. Shearer.
Technical Report No. 647, 1976. 132 p. 8 ref., 2 append.

Descriptors: *Primary productivity, *Measurement, *Laboratory tests, *Methodology, *Canada, Incubation, *Photosynthesis, *Phytoplankton.
Identifiers: Experimental Lakes(Canada), Dissolved inorganic carbon.

Incubator measurements of phytoplankton photosynthesis are summarized, using data taken during the ice-free season of 1975 from 16 lake basins in the Experimental Lakes Area (Canada). The most significant methodology change in 1975 was in the procedure for determining dissolved inorganic carbon (DIC) concentration of the samples by an automated conductimetric system rather than by gas chromatography. The variance in the DIC analysis results was much reduced by the procedural change. Many of the samples were carbon-enriched by additions of sodium bicarbonate solution prior to incubation when dissolved inorganic carbon levels were suspected of being so low as to permit significant depletion in the bottle during the incubation period. Sodium carbonate radioisotopes in sodium hydroxide was the radiocarbon source, diluted in distilled water to produce a concentration of approximately 11 micro-Curies/ml. A light baffle of black acrylic sheeting was installed on the front surface of each incubation chamber to block all light to the sample wheels, and by reducing reflected light these baffles greatly increased light uniformity at all regions on any given wheel. Tabulated records of the phytoplankton production data with related physical parameters for all 1975 measurements, and production plots versus irradiance for the incubator experiments are presented in two appendices. (Auen-Wisconsin)
W77-04868

WASTED HEAT AND AQUATIC ECOSYSTEMS,
Atkins Research and Development,Epsom (England).
A. J. O'Sullivan, and R. I. Collinson.
Effluent and Water Treatment Journal, Vol. 16, No. 1, p. 15-29, 1976. 2 fig., 3 tab., 30 ref.

Descriptors: *Thermal pollution, *Cooling water, *Water pollution effects, *Energy, Water pollution sources, Heated water, Industries, Biological communities, Reproduction, Aquaculture, Fish farming, Heating, Thermal stress, Horticulture, Greenhouses, Powerplants.
Identifiers: *Waste heat utilization, Synergistic effects, Household heating, United Kingdom.

Demands for water for power station cooling will double over the next 30 years, implying great increases in discharges of heated water to the environment. The effects of thermal effluents, while pronounced, depend largely upon climatic conditions and the degree of existing pollution from other sources. Few instances of direct mortality have been caused in ecosystems by heated water; the greatest problems are indirect, in that life cycles of organisms are pushed out of phase with far reaching effects during winter, when fish populations are most susceptible to rapid temperature fluctuations and when a power station may be shut down. The 'total energy' concept involving of power and energy sources and the use of a multidisciplinary approach in the design of energy systems is proposed, such as heating horticultural greenhouses (which can be located adjacent to a power plant), and in household heating. A scheme for modifying the condensing turbine to a back-pressure turbine and energy distribution to dwellings is proposed; it incorporates more efficient electricity generation and conservation. (Auen-Wisconsin)
W77-04869

CONNECTICUT RIVER BASIN PROGRAM. PART III, PHASE I. WATER QUALITY RECONNAISSANCE FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass., Region I.
For primary bibliographic entry see Field 5G.
W77-04871

EFFECTS OF ENERGY-RELATED ACTIVITIES ON THE ATLANTIC CONTINENTAL SHELF,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 6G.
W77-04934

REVIEW OF OIL SPREADING ON THE SEA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W77-04940

PLANKTON PROCESSES IN MID-ATLANTIC NEARSHORE AND SHELF WATERS AND ENERGY-RELATED ACTIVITIES,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
T. J. Smayda.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 70-95, June 1976. 11 fig, 77 ref. NSF-GA-31319X.

Descriptors: *Continental Shelf, *Plankton, *Water pollution sources, *Water pollution effects, *Resources development, Coasts, Estuaries, Phytoplankton, Thermal pollution.
Identifiers: *Outer Continental Shelf, *Energy resources, Environmental factors, Petroleum hydrocarbons, Chlorinaceous compounds, Trace metals.

Energy-related activities may release into the sea petroleum hydrocarbons, chlorinaceous compounds, thermal effluent, and trace metals and may also influence the transparency of the recipient waters. The potential impact of these and other energy-related perturbants on plankton dynamics will obviously be influenced by the 'natural' factors and processes characteristic of the stressed area. Seasonal and regional differences in effect are to be expected. The general characteristics of the plankton processes in the Mid-Atlantic nearshore and offshore waters are emphasized to put into perspective their natural dynamics subject to potential impact and modification. The potential effects of temperature and petroleum hydrocarbons on key plankton processes and events are also considered, based on phytoplankton physiology. As for natural processes, only some general aspects are considered, without reference to a specific region. Nearshore waters are more likely to be affected by calefaction and chlorine discharge from nuclear power generating plants; on the continental shelf, oil release is a more likely source of contamination. However, shore-based activities of the petrochemical industry may also stress recipient waters, as would discharge from tankers that collide on shipping lanes or discharges from tankers in port. (See also W77-04934) (Sinha-OEIS)
W77-04941

PETROLEUM, TEMPERATURE, AND TOXICANTS: EXAMPLES OF SUSPECTED RESPONSES BY PLANKTON AND BENTHOS ON THE CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. P. Jeffries, and W. C. Johnson, II.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 96-108, June 1976. 2 fig, 5 tab, 34 ref.

Descriptors: *Water pollution effects, *Resources development, *Plankton, Benthos, Temperature, Toxicity, Continental Shelf, Ecology, Population, Aquatic populations.
Identifiers: *Outer Continental Shelf, *New York Bight, Energy resources, Petroleum, Toxicants.

Gross population changes carefully enumerated over time in natural communities of the New York Bight and nearby areas are examined. From such comparisons a basic appreciation of ensitivity within natural systems can be obtained. Although fewer energy-related studies have been made on holoplanktonic copepods than on other components in the plankton, present knowledge allows a general assessment of effect. Responses among the copepods to man's activities range from unimportant to significant. In no case, however, is there sufficient evidence to show altered structure or abnormal function of the copepod fauna beyond spatially limited areas. Diversity and abundance are, therefore, still controlled naturally, even in such heavily used areas as the New York Bight. (See also W77-04934) (Sinha-OEIS)
W77-04942

STRUCTURE AND STABILITY IN THREE MARINE BENTHIC COMMUNITIES IN SOUTHERN NEW ENGLAND,
Marine Biological Lab., Woods Hole, Mass.
A. D. Michael.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 109-125, June 1976. 4 fig, 7 tab, 36 ref.

Descriptors: *Benthos, *Baseline studies, *Resources development, Aquatic life, Ecology, *Continental Shelf, *Estuaries, Coasts, *New England, Massachusetts.
Identifiers: *Outer Continental Shelf, *Energy resources, Long Island Sound, Buzzards Bay, Cape Cod Bay, Environmental factors.

Although information on the shelf benthos is scant, it is known what types of species are present and their approximate abundances (within an order of magniture). There is a high degree of overlap between the benthos of large open embayments such as Cape Cod Bay and the adjacent continental shelf. The major change in benthic fauna occurs on the lower continental slope. In spite of the scant information available for the shelf benthos and the inadequancies of inshore data, some significant advances have recently been made. The more numerous data from inshore areas make us more cognisant of the sampling problems and the spatial and temporal variation in benthic communities. The application of the concept of opportunism and data from communities responding to stress in Long Island Sound and Buzzards Bay has improved understanding of the biology of these systems. (See also W77-04934) (Sinha-OEIS)
W77-04943

LABORATORY EXPERIMENTS ON THE EFFECTS OF OCEAN DUMPING ON BENTHIC INVERTEBRATES. I. CHOICE TESTS WITH SOLID WASTES,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
B. D. Chang, and C. D. Levings.
Department of the Environment Fisheries and Marine Service, Research and Development Directorate, Technical Report No. 637, 1976. 74 p, 19 fig, 11 tab, 62 ref.

Descriptors: *Waste disposal, *Water pollution effects, *Baseline studies, *Environmental effects, Coasts, Pollutants, Benthic fauna, Invertebrates, Path of pollutants.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Bottom substrates, Brisaster latifrons, Chiridota laevis, Hemigrapsus oregonensis, Munida quadrispina, Pandalus danae, Crangon alaskensis, Macoma inconspicua, Corophium salmonis.

One of the important effects of ocean dumping is to change the physico-chemical nature of substrates, and the effects of such changes on some benthic invertebrates were examined in laboratory 2-choice preference tests. The following species were tested: the heart urchin Brisaster latifrons, the burrowing sea cucumber Chiridota laevis, the Dungeness crab Hemigrapsus oregonensis, the 'squat lobster' Munida quadrispina, the shrimps Pandalus danae and Crangon alaskensis, the bivalve Macoma inconspicua, and the amphipod Corophium salmonis. The substrates tested represented natural substrates and substrates altered by dumping of solid wastes, and included the following: mud, sand, rocks, wood chips, wood debris, and polluted sediments from near pulp mills. The unnatural substrates were usually less preferred by burrowing animals, although in some cases no preferences were shown between artificial and natural substrates. Mobile epifauna were attracted toward hard surfaces (wood debris, rocks). Because of the preferences and field distributions, the results of the study indicated that large changes in the nature of a substrate as a result of dumping will affect the abundance and species composition of benthic communities. (Sinha-OEIS)
W77-04949

EFFECTS OF OFF-ROAD VEHICLE USE ON THE HYDROLOGY AND LANDSCAPE OF ARID ENVIRONMENTS IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-04980

DISTRIBUTION AND EFFECTS OF HEAVY METALS IN A CONTAMINATED LAKE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
A. McIntosh, and W. Bishop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 037, Price codes: A05 in paper copy, A01 in microfiche.
Purdue University Water Resources Research Center, Technical Report No. 85, December 1976. 69 p, 6 fig, 19 tab, 63 ref. OWRT A-036-IND(1).

Descriptors: *Heavy metals, *Lakes, *Fish behavior, Lead, Cadmium, Zinc, Chromium, Lake sediments, Water chemistry, *Indiana, Distribution, *Path of pollutants, Water pollution effects, Fish physiology, *Sunfishes, Lethal limit.
Identifiers: *Fish physiological response.

This study was conducted on a small lake in Northeastern Indians. The principal heavy metal investigated was cadmium; however lead, zinc, and chromium were also studied. The lake was the recipient of industrial waste, particularly from an electroplating plant. Concentrations of metals in the water averaged 3.2 microgram Cd/1, 139 microgram Zn/1 and 18 microgram Pb/1, Concentrations in the sediments were 100 to 500 times that in the water. The concentration of each of the metals was significantly higher in fish (bluegills) from the contaminated lake than in fish from a non-metal contaminated lake. Sublethal cadmium concentrations (50-115 microgram/1) did not significantly affect the breathing rate of bluegill, but cough rate was proportional to the Cd concentration in the water.
W77-05001

EMBRYOPATHIC EFFECTS OF WATERBORNE AND SEDIMENT-ACCUMULATED CADMIUM, MERCURY AND ZINC ON REPRODUCTION AND SURVIVAL OF FISH AND AMPHIBIAN POPULATIONS IN KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
W. J. Birge, and J. A. Black.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 043, Price codes: A03 in paper copy, A01 in microfiche.
Research Report No. 100, January 1977. 28 p, 9 tab, 58 ref. OWRT A-061-KY(1), 14-31-0001-5017, 14-34-0001-6018.

Descriptors: Water pollution effects, Pollutant identification, Sediments, Metals, *Bioassay, Bioindicators, Eggs, Embryonic growth stage, *Kentucky, *Cadmium, *Mercury, *Zinc, Fish reproduction, Mortality, *Bottom sediments.

Fish and amphibian egg cultures were used to determine the embryopathic effects of cadmium, mercury, and zinc released from natural and metal-enriched sediments, and to develop egg culture bioassay procedures suitable for monitoring bottom sediments for hazardous contaminants. Eggs of the narrow-mouthed toad, goldfish, and rainbow trout were cultured in contaminant-free water added to natural and metal-enriched sediments. Exposure was initiated after fertilization (toad, and goldfish) or at 10 days prehatching (trout) and maintained continuously through 4-10 days posthatching. Sediments were enriched with 0.1-100 ppm cadmium and mercury and 1.0-1000 ppm zinc. Natural control sediments contained average concentrations of 0.052 ppm mercury, 1.0 ppm cadmium, and 108.2 ppm zinc. Substantial frequencies of mortality and teratogenesis occurred for all 3 animal species when eggs were cultured over natural sediments further enriched with as little as 0.1-1.0 ppm cadmium or mercury and 1-10 ppm zinc. Survival of trout embryous and alevins closely paralleled sediment test concentrations. The sediment TL50 concentrations for trout stages cultured from 10 days prehatching through 10 days posthatcing were approximately 1 ppm for mercury, 2.15 ppm for cadmium, and 210.6 ppm for zinc. (Huffsey-Kentucky)
W77-05003

TOWARD SIMULATION AND SYSTEMS ANALYSIS OF NUTRIENT CYCLING IN THE OKEFENOKEE SWAMP, GEORGIA,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 5B.
W77-05005

SURVEY OF MARINE COMMUNITIES IN PANAMA AND EXPERIMENTS WITH OIL,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
C. Birkeland, A. A. Reimer, and J. R. Young.
Environmental Protection Agency, Ecological Research Series No. EPA-600/3-76-028, May 1976. 192 p, 6 fig, 39 tab, 31 ref, 7 append.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Environmental effects, *Intertidal areas, *Aquatic life.
Identifiers: Outer Continental Shelf, Panama, Macroinvertebrates, Bunker C oil, Diesel oils.

Baseline surveys were conducted on both the Caribbean and Pacific coasts of Panama. The structure of macroinvertebrate communities along the Caribbean transect are presented from data collected for over 500 identified species in 108 samples including a total of over 50,000 specimens. Recruitment to benthic communities was investigated with settling plates. The Caribbean was found to be seasonal in species occurrence while the Pacific was seasonal in productivity. The effects of oil pollution on tropical intertidal marine communities were tested by precisely controlled experiments utilizing tarry Bunker C and volatile marine diesel oils. Bunker C oil had a greater detrimental effect than did marine diesel oil on coral growth. Marine diesel oil had a greater detrimental effect than did Bunker C oil on fouling communities of settling plates. When comparing experimentals with controls, growth rates were used as an indicator of the presence of unobserved physiological stress or damage and a quantitative index of the cost of repair. Susceptibility to oil pollution varied significantly between individuals. The growth rates of corals differed significantly with location and time of year so that very precise controls were required in the experiments. (Sinha-OEIS)
W77-05020

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1975 - OCTOBER 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05023

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05024

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1975 - JANUARY 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05025

OIL SPILL AND OIL POLLUTION REPORTS FEBRUARY 1976 - APRIL 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05026

BIOLOGICAL IMPACT CAUSED BY CHANGES ON A TROPICAL REEF,
Guam Univ., Agana. Marine Lab.
R. S. Jones, R. H. Randall, and M. J. Wilder.
U.S. Environmental Protection Agency Ecological Research Series No. EPA-600/3-76-027, April 1976. 222 p, 63 fig, 22 tab, 27 ref, 4 append. Grant No. R802633.

Descriptors: *Coral, *Reefs, *Powerplants, *Thermal pollution, *Heated water, *Benthos, *Water pollution effects, *Environmental effects, Tropical regions, Thermal stress.
Identifiers: *Guam, Wave action, Thermoelectric powerplants, Acanthaster planci(L.).

A biological study is conducted on a fringing coral reef adjacent to a thermoelectric power plant on Guam, before and after release of plant effluent. Release of plant effluent results in an elevation of water temperature on the adjacent reef flat and reef margin, and wave action exposes even the deeper parts of the reef margin to temperatures

above ambient as well as other potentially detrimental effluent parameters such as chlorine and heavy metals. Introduction of the effluent is shown to be responsible for recent destruction of reef margin corals. Effluent is found to stratify beyond the surf zone and is no longer a threat to benthic organisms. Coral transect studies show an increase in recent coral re-colonizaton on the reef front, terrace and slope since the Acanthaster infestation. No such recovery is evident in benthic habitats of the reef margin, exposed to effluent. Thermal simulation experiments, performed on a series of reef corals in the laboratory, suggest mean upper tolerance limits for the corals between 30 and 33C. These temperatures are common on the reef margin adjacent to the power plant. Sublethal elevation of temperature is shown to reduce growth rate in some of the coral species. Recommendations are made to release the effluent in deeper water in order to provide a greater mixing zone and to relieve present stress on reef margin organisms. (Sinha-OEIS)
W77-05027

THE ECOLOGICAL IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, Fla.
J. L. Lincer, M. E. Haynes, and M. L. Klein.
U.S. Environmental Protection Agency Ecological Research Series No. EPA-600/3-76-075, September 1976. 363 p. 16 tab, 732 ref, 2 append.

Descriptors: *Estuaries, *Ecosystems, *Water pollution effects, Pesticides, Bibliographies, Organic compounds, Toxicity, Water resources, Ecology.
Identifiers: Resources development.

This review and indexed bibliography concerns the presence and effects of pesticides (i.e., insecticides, herbicides, fungicides, etc.) and industrial toxicants in the estuarine ecosystem. The industrial toxicants refer, primarily, to polychlorinated biphenyls, but phthalate esters, polychlorinated terphenyls, chlorinated dibenzodioxins and dibenzofurans are also discussed. The review covers literature of the past decade, with emphasis on the most recent 5 years. However, the 700-plus references in the bibliography span a much wider range. A permuted keyword retrieval system (SPINEX) is provided to allow practical use of the bibliography by scientists, academicians, and societal decision makers. (Sinha-OEIS)
W77-05028

COLUMBIA BASIN SALMON AND STEELHEAD ANALYSIS, SUMMARY REPORT,
Biological Services, Inc., Portland, Oreg.
E. Chaney, and L. E. Perry.
Pacific Northwest Regional Commission, National Marine Fisheries Service, Portland, Oregon, September 1, 1976, 74 p., 19 tab., 51 fig.

Descriptors: *Salmon, Rainbow trout, *Columbia River, Commercial fish, Dams, Dam sites, *Fish migration, Fish passage, Mortalities, Monitoring, Fish hatcheries, Spillways, *Hydraulic turbines, Supersaturation, Nitrogen, Water resources, Statistics, Pollutant identification.
Identifiers: *Snake River System, *Upper Columbia River, *Main-stem Columbia, Fish passage, Losses, Snake River Dams, *Columbia River Dams, Habitat destruction, Habitat degradation, Nitrogen supersaturation, Flow Manipulation.

This report deals with the salmon and steelhead fisheries of the Columbia River fishery. Subjects discussed are the early commercial fisheries, habitat destruction and degradation, fish passage losses at main-stem Columbia and Snake River dams, the ocean fisheries, artifical propagation, current status of the fishery socioeconomic implications, current major compensations, rehabilation and protection programs and conclusion and recommendations. (Katz)
W77-05077

EFFECT OF ATMOSPHERIC GAS SUPERSATURATION ON SALMON AND STEELHEAD TROUT OF THE SNAKE AND COLUMBIA RIVERS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. J. Ebel, and H. L. Raymond.
Marine Fisheries Review, Vol. 38(7), July 1976, p. 1-14, 9 tab., 13 fig., 20 ref.

Descriptors: *Salmon, *Rainbow trout, Columbia River, *Supersaturation, Bioassay, *Mortality, On-site data collection, Water temperature, Anadromous fish, Depth, *Nitrogen, Juvenile fish, Laboratory study, Pathology, Fish disease, Behavior, Fish passage, Adult fish, Water pollution effects.
Identifiers: *Gas bubble disease, *Nitrogen supersaturation, Atmospheric gas supersaturation, Steelhead trout, Dissolved nitrogen, Disease symptoms, Vertical distribution.

Laboratory and field research data defining the effects of supersaturation of atmospheric gas on fish (primarily salmonids) in the Columbia River are summarized. Recent bioassay information regarding effects of various levels of supersaturation on several species of salmonids are compared with observations obtained in the river. The severity of the effect of supersaturation was dependent on level of supersaturation, the duration of exposure, water temperature, general physical condition of the fish, and the swimming depth maintained by the fish. Mortality caused by supersaturation was estimated for each of several years from 1966-74. (Katz)
W77-05078

WATER RESOURCES SERVICE DISSOLVED GAS STUDY: INTERIM DATA SUMMARY,
British Columbia Water Resources, Victoria. Pollution Control Branch.
M. J. R. Clark.
Department of the Environment, (1976), 200 p., 150 tab., 11 ref.

Descriptors: *Canada, *Supersaturation, *Columbia River, Monitoring, On-site investigation, Fish diseases, *Water quality, Dam, Dam sites, Nitrogen, Data collection, *Hydrologic data, Onsite data collection, Pollutant identification.
Identifiers: British Columbia, British Columbia rivers, British Columbia lakes.

In 1972 the Water Resources Service initiated a continuing survey program to ascertain to what extent levels of gas supersaturation of sufficient magnitude to cause gas bubble disease in fish occur in provincial waters. The results to date have been reported in a number of Water Resources Service reports and publications. Also, many of the results are recorded on the Water Resources Service's computer data base, EQUIS. This present document has been prepared to serve as an interim summary of dissolved gas data collected by various agencies for several rivers and lakes in British Columbia. (Katz)
W77-05080

WATER RESOURCES SERVICE DISSOLVED GAS STUDY: COMPILATION OF FIELD MEASUREMENTS,
British Columbia Water Resources, Victoria. Pollution Control Branch.
M. J. R. Clark.
April 12, 1976, 97 p., 95 tab.

Descriptors: *Canada, Fresh water, Rivers, *Monitoring, On-site investigations, On-site data collection, *Supersaturation, Oxygen, *Nitrogen, Columbia river, *Dam sites, Water quality, Data collection, *Pollutant identification.
Identifiers: British Columbia, Percent saturation.

In 1972 the Water Resources Service initiated a continuing survey program to ascertain to what extent levels of gas supersaturation of sufficient magnitude to cause gas bubble disease in fish occur in provincial waters of British Columbia. The results to date have been reported in a number of Water Resources Service reports and publications. Also many of the results are recorded on the Water Resources Service's computer data base, EQUIS. This present document has been prepared to preserve the field data and field comments in case these might be of value for future use. (Katz)
W77-05081

REPORT ON THE RESULTS OF A MONITORING PROGRAMME FOR DISSOLVED GASES IN THE FRASER RIVER AND PEACE RIVER SYSTEMS, 1974,
British Columbia Water Resources Service, Victoria. Pollution Control Branch.
D. H. G. Ableson.
Pollution Control Branch, 1975, 40 p., 5 tab., 5 fig., 41 ref.

Descriptors: *Supersaturation, Freshwater, *Canada, *Monitoring, On-site investigations, *Fish diseases, *Water quality, Dam, Dam sites, Discharge(Water), Spillways, *Pollutant identification.
Identifiers: British Columbia, Fraser River, Peace river, Gas Bubble disease, WAC Bennett Dam.

Throughout the summer of 1974, dissolved gas monitoring was carried out on the Fraser River and Peace River system. Overall values were at a level below which the occurrence of gas bubble disease in fish would develop. Peace river values were slightly higher than Fraser River results, but still well below the critical level. No discernible increases were recorded during the period of spillway discharge from the WAC Bennet dam.
W77-05082

AN ELECTRONIC MONITOR FOR TOTAL DISSOLVED GAS PRESSURE,
Virginia Mason Research Center, Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-05083

INFLUENCE OF DISSOLVED ATMOSPHERIC GAS ON SWIMMING PERFORMANCE OF JUVENILE CHINOOK SALMON,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
M. H. Schiewe.
December, 1973, 17 p., 1 fig., 14 ref.

Descriptors: *Salmon, Anadromous fish, Behavior, Animal physiology, Laboratory tests, *Fish behavior, Environment, Supersaturation, Saturation, Water quality, Fish disease.
Identifiers: *Chinook Salmon, *Dissolved atmospheric gases, Juvenile Chinook Salmon, Swimming performance, Oncorhynchus tshawytscha, Swimming capability.

Juvenile chinook salmon, Oncorhynchus tshawytscha, were exposed to selected levels of dissolved atmospheric gas ranging from 100 (control) to 120% of saturation, and surviving fish were then tested for maximal swimming performance. Decreased swimming capability resulted from exposure to concentrations ranging from 106 to 120% of saturation if the fish were tested immediately; other tests indicated that recovery of swimming capabilities occurred whithin 2 hr if the fish were returned to equilibrated water (100% of atmospheric saturation) before testing. (Katz)
W77-05084

GAS SUPERSATURATION RESEARCH, NATIONAL MARINE FISHERIES SERVICE, PRESCOTT FACILITY, 1971-1974,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
T. H. Blahm, B. McConnell, and G. R. Snyder.

1974, 24 p., 5 tab., 7 fig., 1 ref.

Descriptors: *Salmon, *Trout, *Fish diseases, *Supersaturation, Monitoring, Behavior, On-site data collections, Pathology, Mortality, Bioassay, Animal physiology, Gases, Nitrogen, Equilibrium, *Columbia River, Oregon, *Toxicity, *Lethal limit.
Identifiers: Lower Columbia River, Steelhead trout, Chinook salmon, Whitefish.

Research on effects of nitrogen supersaturation were conducted at Prescott. The lethality of Columbia River waters was determined. In addition the avoidance and detection of gas supersaturation was determined, as well as the vertical depth distribution of fish, intermittent exposure to supersaturated and equilibrated waters. Daily water monitoring had been conducted since 1971. Other biological test programs were proposed. (Katz)
W77-05085

PROGRESS REPORT ON CORPS OF ENGINEERS ACTIVITIES RELATED TO SUPERSATURATED GASES,
Army Engineer Div. North Pacific, Portland, Oreg.
For primary bibliographic entry see Field 5A.
W77-05086

STRUCTURAL MODIFICATIONS,
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 8A.
W77-05087

NITROGEN SUPERSATURATION PROBLEM, PUBLIC MEETING, MARCH 23, 1971,
Army Engineer Div. North Pacific, Portland, Oreg.
For primary bibliographic entry see Field 5A.
W77-05088

STEPS BEING TAKEN BY CORPS OF ENGINEERS TO RESOLVE NITROGEN PROBLEMS,
Army Engineer Div. North Pacific, Portland, Oreg.
For primary bibliographic entry see Field 5C.
W77-05090

STEPS BEING TAKEN BY CORPS OF ENGINEERS TO RESOLVE NITROGEN PROBLEMS,
Army Engineer Div. North Pacific, Portland, Oreg.
C. E. Hildebrand.
Presented at Governor's Meeting, Nitrogen Supersaturation Problem - Columbia and Snake Rivers, Bonneville Power Administration, Portland, Oregon, March 23, 1971, 8 p., 4 fig.

Descriptors: *Columbia River, *Supersaturation, Dams, Dam sites, *Operations, Operations research, On-site investigations, Fish migration, *Fish passage, Spillways, *Engineering structures, Hydraulic engineering, Hydroelectric power, Hydrographic analysis, Hydrographic hydrologic data.
Identifiers: *Snake River, Bonneville Dam, The Dalles Dam, John Day Dam, McNary Dam, Ice Harbor Dam, Lower Monumental Dam, Little Goose Dam, *Gas bubble disease, *Nitrogen, *Supersaturation.

The measures being taken by the Corps of Engineers and other to help resolve the nitrogen supersaturation problem of the Columbia River were presented. The presentation was concerned with modification in the regulation of reservoirs and in the operation of projects in order to help abate the nitrogen problem. (Katz)
W77-05090

REVIEW OF GAS SUPERSATURATION RESEARCH DONE BY NATIONAL MARINE FISHERIES SERVICE AT PRESCOTT FIELD FACILITY -- 1969-1974,
National Marine Fisheries Service, Longview, Wash. Prescott Field Facility.
T. Blahm.
Prescott Field Facility, February 14, 1974, 6 p., 1 fig., 6 ref.

Descriptors: *Columbia River, *Fish diseases, *Supersaturation, Salmon, Bioassay, Mortalities, Behavior, Nitrogen, Rainbow trout, Bass, Animal physiology, Oxygen, Water quality, Laboratory studies, On-site investigations, *Monitoring.
Identifiers: *Gas bubble disease, Steelhead trout, Chinook salmon, Coho salmon, Vertical distribution, Intermittent exposure.

Gas monitoring has been done at the Prescott Field Station since 1969 and the data has been reported. Bioassay studies to determine the effect on salmon fingerlings of prevailing Columbia River conditions were reported. Research on sublethal effects of gas supersaturation is underway. (Katz)
W77-05091

RELATIONS BETWEEN FISH BEHAVIOR, BIOASSAY INFORMATION AND DISSOLVED GAS CONCENTRATIONS ON SURVIVAL OF JUVENILE SALMON AND STEELHEAD TROUT IN SNAKE RIVER,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. J. Ebel.
1973, 12 p., 4 tab., 3 fig., 2 ref.

Descriptors: *Bioassay, *Mortality, *Salmon, *Supersaturation, *Fish diseases, Nitrogen, Dams, Dam sites, Fish migration, Fish passage, Anadromous fish, Laboratory tests, Columbia River, *Fish behavior, Rainbow trout.
Identifiers: Chinook salmon migrants, Steelhead trout, *Gas bubble disease, Lethal exposure, Chinook fry, Vertical distribution, *Snake River.

The estimated loss for 1970 where all factors such as depth distribution, exposure time, bioassay information and dissolved gas levels are considered illustrates how estimates of losses attributable to supersaturation of nitrogen can become complex when considering naturally migrating salmon populations. In 1970-1972 it appears unlikely that losses attributable to supersaturation of nitrogen alone exceeded 40%. (Katz)
W77-05092

NOTES FOR MID-COLUMBIA PUD'S AND WASHINGTON DEPARTMENT OF ECOLOGY MEETING ON REVISED CONCEPTUAL PLAN FOR COMPLYING WITH SUPERSATURATED GAS STANDARD.
Mid-Columbia Public Utility Districts, Ephrata, Wash.
Presented to Washington Department of Ecology hearing on proposed nitrogen standard. Hearing, Public Works Committee, U.S. House of Representatives, 1972, 34 p., 6 tab., 12 fig.

Descriptors: *Salmon, *Rainbow trout, *Columbia River, Adult fish, Fish migration, Hydroelectric power, Dams, Dam sites, On-site investigations, Supersaturation, Spillways, Hydrographic analysis, Operations, Water quality, History, Grand Coulee Dam, Supersaturation, Nitrogen, Mortality.
Identifiers: *Snake River, *Gas bubble disease, *Mid-Columbia River, Nitrogen supersaturation.

The position is presented that the mid-Columbia River areas do not have the gas supersaturation problems similar to those experienced in the Snake and Lower Columbia Rivers. This belief is supported by the historic record of adult salmon and steelhead passage in the mid-Columbia River. (Katz)
W77-05093

INTERIM REPORT ON SURVIVAL OF COHO SALMON FINGERLINGS PASSING THROUGH OPERATING TURBINES WITH AND WITHOUT PERFORATED BULKHEADS AND OF STEELHEAD PASSING THROUGH SPILLWAYS WITH AND WITHOUT A FLOW DETECTOR,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. W. Long, and F. J. Ossiander.
1974, 4 p., 2 tab.

Descriptors: *Columbia River, *Dams, Dam sites, *Salmon, Rainbow trout, *Fish passage, Fish migration, Mortality, Juvenile fish, On-site test, On-site investigations, Spillways, *Bulkhead gates, *Mortality.
Identifiers: *Coho salmon, Coho fingerlings, Steelhead trout fingerlings.

Perforated bulkheads can be used in operating turbines without increasing the loss of fish. Spillways equipped with flow deflectors are less harmful to steelhead than are standard spillways. (Katz)
W77-05094

A REPORT ON THE RESULTS OF A MONITORING PROGRAMME FOR DISSOLVED GASES IN SELECTED WATERS OF BRITISH COLUMBIA, 1972,
British Columbia Water Resources Service, Victoria. Pollution Control Branch.
M. J. R. Clark, and L. Regan.
January 9, 1973, 25 p., 4 tab., 5 fig., 19 ref.

Descriptors: Freshwater, *Monitoring, *Columbia River, *Supersaturation, *Fish diseases, Salmon, *Nitrogen, Mortality, Adaptation, Animal physiology, Analytical methods, *Dissolved oxygen, Carbon dioxide, On-site investigations, Pollutant identification.
Identifiers: British Columbia, Fraser River, Peace River, Kootenay River, *Gas bubble disease.

During the summer of 1972, Pollution Control Branch personnel surveyed dissolved gas saturation levels for selected provincial waters. The following maximum results were observed for total % saturation and % saturation of N2 respectively: Fraser River (115.2%, 119.6%); Peace River (114.1%, 109.9%); Kootenay River (115.6%, 117.4%); and Columbia River (133.8%, 138.5%). Although fisheries biologists have not as yet established the exact conditions under which gas bubble disease (gas embolism) may occur in fish, preliminary bioassay experiments indicate that values of 105-130% saturation of nitrogen cause significant mortality in salmonids restricted to the upper four feet of water but not to salmonids for which deeper water is available. (Katz)
W77-05095

A REPORT ON RESULTS OF A MONITORING PROGRAMME FOR DISSOLVED GASES IN SELECTED WATERS OF BRITISH COLUMBIA, 1972-73,
British Columbia Water Resources, Victoria. Pollution Control Branch.
M. J. R. Clark.
May 27, 1974, 41 p., 20 tab., 3 fig., 40 ref.

Descriptors: *Supersaturation, Freshwater, *Columbia River, *Monitoring, On-site investigation, *Fish diseases, Water quality, Dam, Dam sites, *Nitrogen, Bioassays, *Mortality, *Canada, *Pollutant identification.
Identifiers: Fraser River, Peace River, Kootenay River, Gas bubble disease.

In 1972 the Pollution Control Branch initiated a continuing but preliminary survey of dissolved gas saturation levels for selected provincial waters. The following maximum total saturation results have been observed for 1972 and 1973 respectively: Fraser River (115.2%, 108.7%); Peace River (114.1%, --); Kootenay River (115.6%, 121.1%; Columbia River (133.8%, 114.8%); and Pend

d'Oreille River (119.1%, 121.1%). Although fisheries biologists have not as yet established the exact conditions under which gas bubble disease may occur in fish, preliminary bioassay experiments indicate that values of 105-130% saturation of nitrogen cause significant mortality in salmonids restricted to the upper four feet of water but not to salmonids for which deeper water is available. Thus, the observed values do indicate that gas bubble disease is of potential concern in provincial waters. (Katz)
W77-05096

INVESTIGATIONS ON THE PHYTOPLANKTON OF THE NORTHERN CENTRAL ATLANTIC: I. THE PHYTOPLANKTON OF THE OFFSHORE REGION AT 30 W RELATED TO A FEW ENVIRONMENTAL FACTORS DETERMINING THE PRODUCTION, (IN GERMAN),
H. Kurth, and E. Kuehner.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1159-1164, 1973.

Descriptors: *Phytoplankton, *Atlantic Ocean, *Productivity, Diatoms, Sampling, Nutrients, Phosphates, Thermocline.

Plankton samples taken in May and Nov., 1971, at 30 W between 15 N-1 S were evaluated qualitatively and quantitatively. The results are related to the environmental factors which determine production. The phytoplankton in this area was only sparsely developed. Correlations to the depth and the thermocline are shown. Since nutrients are concentrated at the thermocline, the amount of phytoplankton in the euphotic layer increases as the depth of the thermocline decreases. Relationships to the equatorial undercurrent and the phosphate maximum are also indicated. Although diatoms are dominant in coastal waters, Peridineae predominate at the stations on 30 W.--Copyright 1976, Biological Abstracts, Inc.
W77-05097

MACROPHYTES OF LIMNETIC HABITATS AND THEIR REACTION UPON P-TOLUENE SULFONIC ACID IN THE SUBSTRATE: I. ON THE TOLERANCE OF MARSH AND WATER PLANTS OF P-TOLUENE SULFONIC ACID, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Bodenkunde.
R. Kickuth, and T. Tittizer.
Angew Bot. 48(3/4), p 185-194, 1974.

Descriptors: *Organic acids, Marshes, *Marsh plants, Metabolism, Plant physiology.
Identifiers: *Macrophytes, Monocots, *Toluenesulfonic-acid.

Hydrophytes can be cultivated over long periods in solutions containing up to 729 . mg/l p-toluene sulfonic acid. Their tolerance to this chemical decreases in the following order: Lythrum portula > Mentha aquatica > Alisma plantago-aquatica, Polygonum hydropiper > Callitriche stagnalis > Ceratophyllum demersum > Sagittaris sagittiofolia > Ranunculus aquatilis > Lemna minor, Potamogeton natans > Nasturtium sylvestre > Sparganium erectum, Typha latifolia > Phragmites australis > Menyanthes trifoliata, Scirpus lacustris > Iris pseudacorus, Carex riparia, Eleocharis palustris, Potentilla palustris, Juncus bulbosus, J. effusus, J. inflexus. The toxic effects can be ascribed to a specific influence of toluene sulfonic acid, a compound not occurring in nature, on the metabolic processes in the plants and to the marked lowering of the pH in the nutrient solution. Excluding the last factor by buffering the acidity, Iris seedlings can be grown in solutions containing up to 5000 mg/l p-toluene sulfonic acid without any visible damage over a period of 5 wk. (See also W77-05100)--Copyright 1975, Biological Abstracts, Inc.
W77-05099

MACROPHYTES OF LIMNETIC HABITATS AND THEIR REACTION UPON P-TOLUENE SULFONIC ACID IN THE SUBSTRATE: II. ELIMINATION OF P-TOLUENE SULFONIC ACID IN MODEL SYSTEMS WITH MARSH AND WATER PLANTS, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Bodenkunde.
R. Kickuth, and T. Tittizer.
Angew Bot. 48(3/4), p 195-208, 1974.

Descriptors: *Organic acids, Marshes, *Marsh plants, Metabolism, Plant physiology.

A given amount of p-toluene sulfonic acid is permanently reduced by cultivating hydrophytes in solutions containing this compound. This cannot be ascribed to an elimination process by higher plants but may be regarded as a plant-controlled process due to a specific microflora built up by root exudations in the rhizosphere. It can be assumed that the well-known rhizosphere effect in terrestrial biotopes exists in aquatic biotopes too, and is responsible for the differences in the rate of elimination by the various plants and in comparison to dead surfaces. Plants collected from polluted biotopes are superior in tolerance and elimination rate to those found in non-contaminated water. (See also W77-05099)--Copyright 1975, Biological Abstracts, Inc.
W77-05100

5D. Waste Treatment Processes

STUDIES ON THE COLLECTION AND DISPOSAL OF SLURRY IN NORTHERN IRELAND,
Queen's Univ., Belfast (Northern Ireland). Dept. of Agricultural and Food Chemistry.
J. S. V. McAllister.
Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes - 1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 624.

Descriptors: *Slurries, *Poultry, *Cattle, *Climates, Physical treatment, Chemical treatment, Water pollution, Air pollution, Soil contamination, *Farm wastes, Recycling, *Hogs, Waste treatment.
Identifiers: *Northern Ireland, *Land spreading, Toxic gases, Refeeding.

Soil type, cropping system, and climate are the three factors which decide the amount of slurry that can be safely spread on land. A relatively dry climate with a considerable amount of arable cropping is the most satisfactory condition. Conditions deteriorate in a humid climate with heavy rainfall, lower evaporation, and much of the land under grass, as in Northern Ireland. Investigation is being ulndertaken concerning problems with the collection and disposal of slurry. When slurry is stored, toxic gases are produced, the most dangerous being hydrogen sulfide. Slurry which is being carelessly spread or handled can cause pollution of water, of the atmosphere, and of the land Poultry slurry can be dried for use as a ruminant food, and cattle slurry is produced under conditions where there is adequate land for disposal, but pig slurry presents a major problem. Removal of solids by centrifugation and incineration gives an ash high in calcium and magnesium phosphates. Study is being conduted concerning the use of effluents as a substrate for producing single cell protein. (Edwards-East Central)
W77-04613

PHOTOSYNTHETIC PURIFICATION OF THE LIQUID PHASE OF ANIMAL SLURRY,
Queen's Univ., Belfast (Northern Ireland). Dept. of Agricultural and Food Chemistry.
M. K. Garrett, and M. D. B. Allen.
Environmental Pollution, Vol. 10, No. 2, p. 127-139, February, 1976. 6 fig, 2 tab, 15 ref.

Descriptors: *Slurries, *Algae, *Nitrogen removal, Recycling, Effluents, Water pollution, *Farm waste, Phosphorus, Photosynthesis, *Waste treatment, *Chlorella, Liquid wastes.
Identifiers: *Phosphorus removal.

A strain of Chlorella vulgaris was selected from 18 species of freshwater algae which were screened for their ability to grow in and remove phosphorus from slurry supernatants. In a laboratory batch culture system, phosphorus was found to be first solubilized by the developing endogenous bacterial community, then accumulated by the algal cells. Phosphorus removal from the slurry was most rapid on a per cell basis during the early stages of algal growth; however, significant removal occurred even after the maximum algal cell concentration was achieved. The kinetics for nitrogen removal differed from those for phosphorus. The major loss of nitrogen seemed to be due to volatility and the algal contribution was seen only in the later stages of growth. Cells harvested at the end of the logarithmic phase contained 42 percent true protein. Thus, the product might be useful in a cereal-based diet. The study data provide preliminary evidence that algal culture is a biologically feasible method of treatment for the liquid phase of slurry, potentially capable of producing an effluent approaching Royal Commission Standards. (Rowe-East Central)
W77-04615

WASTE TREATMENT RULES WON'T PUT 'IMPOSSIBLE' BURDENS ON PRODUCERS,
For primary bibliographic entry see Field 5G.
W77-04616

NORTH CAROLINA SWINE OPERATION SOLVES ODOR, WASTEWATER PROBLEMS,
For primary bibliographic entry see Field 5G.
W77-04618

HYGIENIC PROBLEMS OF DISPOSAL, TREATMENT AND UTILIZATION OF LIQUID MANURE,
Universitaet Hohenheim (Landwirtschftliche Hochschule (West Germany).
D. Strauch.
In: Progress in Animal Hygiene, F. Kovacs and P. Rafai, (ed). Budapest, Akademiai Kiado, 1975. p 33-36.

Descriptors: *Liquid wastes, *Waste treatment, *Waste disposal, *Aeration, Water pollution, Groundwater, Crop response, Electrolysis.
Identifiers: *Pathogens, *Land disposal, Radioactive irradiation.

In modern agriculture, excrements of animals are produced mostly as liquid manure. From the hygienic point of view, the main difference from solid manure is the lack of self-heating so that a very important influence on pathogenic microorganisms is absent. Therefore, the liquid manure must be disinfected in the livestock production unit to prevent pathogens from being carried out of the production site. This is often done by means of chemical disinfectants, but care must be taken in using them. Such chemical disinfectants as caustic soda and chlorinated lime will cause damage to plants and therefore prevent the liquid manure from being used as fertilizer. Also, despite the availability of disinfectants for treatment of slurry, there is none with a universal effect. Other methods of treatment that are being utilized involve electric current (ie. radioactive irradiation and electrolysis) and aeration (ie. surface aeration and the ventilating process). Most of these systems are based on the fundamental principle of separating liquid from solid phase. Such separation is not satisfactory as long as the pathogenic microorganisms are not destroyed. Other problems associated with these waste management systems arise with collecting and spreading slurry. Odor is a particular problem, especially from pigs

and poultry. Various methods of deodorization by biological, chemical or technical means are being investigated. The problem of residues of chemical deoderants in the organs of animals requires special attention. Also, the question of soil and plant tolerance for large amounts of slurry is being extensively studied. It is known that fertility of the soil is damaged by large amounts of liquid manure. Large doses of slurry also cause a very heavy leaking of NO3 into the groundwater. (Merryman-East Central)
W77-04621

ANALYSIS OF LIQUID MANURE TREATMENT IN HUNGARY, WITH SPECIAL REGARD TO ENVIRONMENTAL PROTECTION,
Research Inst. for Management of Water Supplies Budapest (Hungary).
L. Vermes.
In: Progress in Animal Hygiene, F. Kovacs and P. Rafai, (ed). Budapest, Akademiai Kiado, 1975. p 37-39, 1 tab.

Descriptors: *Liquid wastes, *Waste treatment, *Waste storage, *Waste disposal, Fertilizers, Irrigation, Fish farming, *Farm wastes.
Identifiers: *Hungary, *Land disposal.

In Hungary, the general tendency has been the agricultural utilization of as much liquid manure as possible, or at least its disposal into the soil, but attempts have also been made at its purification. Agricultural utilization may be accomplished by fertilization of land or use in farm ponds to grow fish. Promising results of the latter warrant further study. The liquid manure may be utilized either after separation of liquid and solid phase or without separation of the phases. If the liquid manure is separated, the solid and liquid phases are treated distinctly. The solids phase is deposited and later used for dunging; the liquid phase is stored for a given time and then carried to the fields or disposed of in another way. Separation of liquid manure is sometimes omitted in order to preserve the manure's valuable components as much as possible until utilization. In Hungary, purification of liquid manure has been attempted unscuccessfully in 2 units--the Pasveer-type oxidation ditch and a combined mechanical-chemical-biological procedure. Chemical analysis of liquid manure has revealed it to be a dangerous water pollutant; analysis has also shown that it contains important plant nutrients and thus is a valuable fertilizer. In view of the requirements of water quality and environmental protection, direct disposal of liquid manure into the soil under well controlled conditions would appear to be the most feasible waste management method. Transport to the fields should take place in the shortest possible time, by the shortest route, and under consideration of the capacity of the soil so that its fertility may be maintained as long as possible. The use of homogenated liquid manure for continuous irrigation meets not only the hygienic requirements but it is also profitable from the agricultural point of view. The separated liquid phase can be utilized in the same manner if appropriate facilities can be provided for its year-round storage with due consideration of the hygienic requirements, also under the conditions of quarantenization. (Merryman-East Central)
W77-04622

HYGIENIC PROBLEMS OF LIQUID MANURE TREATMENT ON LARGE-SCALE FARMS OF THE COUNTY TOLNA,
Tolna County Public Health Station, Szekszard (Hungary).
A. Kovacs.
In: Progress in Animal Hygiene, F. Kovacs and P. Rafai, (ed). Budapest, Akademiai Kiado, 1975. p 76-77.

Descriptors: *Liquid wastes, *Waste treatment, *Public health, Irrigation, Water pollution, *Farm wastes, Waste disposal.
Identifiers: *Hungary, *Animal health, *Waste management, Pathogens, Land disposal.

Large-scale management of livestock units has great technical advantages, but present methods of manure-handling permanently and perhaps irreversibly pollute the environment. This can only be prevented by the collaboration of agricultural, technical, animal hygienic and public health experts. Liquid manure emanating from livestock units in county Tolna, Hungary, consists of noncomposted diluted fresh feces and urine containing many pathogenic microorganisms. Because the liquid manure also contains many valuable ingredients, extensive studies are being conducted on its utilization for irrigation. In one pig unit of the county Tolna, the liquid manure flows through an expensive precipitating apparatus into a storage pond. The original idea was that the irrigation pipe system should be supplied directly from the pond, but this failed because of technical defects. At present, an emergency storage pond is used nearby the unit. In another unit, the liquid manure is collected in cisterns. Originally, a liquid manure tank with filling and emptying pump was planned to transport the manure onto arable land, but it could not manage the large amounts produced. Then, composting of the manure with grass was tried, but this manure doesn't yield to composting. At present, the manure is conducted in open ditches and is allowed to trickle away into the deep ploughed soil. This spoils the arable land which may become unfit for agricultural production within a few years, for agrobiological reasons. In order to resolve the waste management problem so that the requirements of hygiene and agricultural utilization may both be met, county health officials suggested the separation of the liquid and solid phase of the liquid manure in earth-pits. The solid phase could be used for fertilization or composting, whereas the liquid phase could be purified in ponds by using a suitable flora. This waste management is still in the experimental phase, and only the laboratory tests will testify to its efficiency. (Merryman-East Central)
W77-04624

INDUSTRIAL EFFLUENT TREATMENT: PHYSICO-CHEMICAL AND BIOCHEMICAL OPTIONS, (PART II),
Water Pollution Research Lab., Stevenage (England).
J. Borne.
Effluent Water Treatment Journal, Vol. 16, No. 10, p 523-525, 530-531, October, 1976. 1 fig, 4 ref.

Descriptors: *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Waste water treatment, *Sludge treatment, Aerobic treatment, Sludge disposal, *Industrial wastes.
Identifiers: Aqueous emissions, Gaseous emissions, Anaerobic treatment.

Various options for dealing with the problems of organic matter removal from solution, the relationship of aqueous and gaseous emissions, and treatment of waste water sludge are presented. Biological and non-biological options are discussed and evaluated. Anaerobic treatment was found most effective in treating sludge or waste waters containing high concentrations of biodegradable organic matter (BOD greater than 2000 mg/liter) and those which are warm (25-40C). Biological oxidation is usually by either the activated-sludge process or biological filtration. Aqueous and gaseous emissions may be treated by air stripping and thermal destruction; anaerobic biological treatment in covered tanks followed by aerobic biological treatment; biological treatment in covered, artificially ventilated, percolating filters; by activated sludge in an enclosed system with oxygen; or by treatment in a complete-mixing activated-sludge process. Biological treatment of sludges may be accomplished through anaerobic and aerobic digestion and composting, elutriation to remove some fine particles which hinder dewatering, chemical conditioning, thickening, or dewatering. It was concluded that economic evaluation schemes are yet to be perfected and evaluation will continue to be done on an individual basis. (Collins-FIRL)
W77-04633

STUDIES ON MAGNESIUM-BASED SEMICHEMICAL PULPS (4) - THE CHEMICAL RECOVERY FROM THE WASTE LIQUORS AND THEIR REUSE,
Kyushu Univ., Fukuoka (Japan).
S. Chou, M. Sumimoto, and T. Kondo.
Japan Tappi, Vol. 30, No. 11, p 41-48, November, 1976. 5 fig, 6 tab, 12 ref.

Descriptors: *Liquid wastes, Pulp and Paper industry, Industrial production, *Waste water treatment, *Industrial wastes, Pulp wastes, Sulfur, Magnesium, *Water reuse, Reccover, *Pulp wastes.
Identifiers: *Chemical recovery.

The properties related to combustion, chemical recovery, and the reuse of recovered chemicals and relief liquors from waste liquors in magnesium-based semi-chemical pulp production were investigaged. Production methods assessed were the vapor-phase magnetite, magnetite, slurry, two-component, and high-yield sulfite processes. It was shown that heating values of dried solids from waste liquors are highly dependent upon COD values and the amounts of organic matter present. Although weight loss while heating wastes liquors was related to the amount of organic matter, differences in the pulp of these methods was small. Magnesium recovery was high for all methods except the slurry process. Sulfur recovery was affected by the amount of free acids present and the pH of the original cooking liquors. Free acid evaporation from waste liquors produced a positive increment in condensate pH values in all methods except the two-component one. Complete sulfur recovery depends on furnace temperatures of 900C for the high-yield sulfite and two-component process liquors, while 800C is sufficient for the other methods. The reuse of recovered chemicals presented no problems, except for he relief liquor of the vapor-phase magnetite method. Results indicated that the vapor-phase magnetite and (liquid-Phase) magnetite methods were more beneficial than the others. Because the former has the additional disadvantage of a longer cooking time, the later may be the best method available. (Collins-FIRL)
W77-04634

AN EVALUATION OF LAND TREATMENT OF MUNICIPAL WASTE WATER AND PHYSICAL SITING OF FACILITY INSTALLATIONS,
Office of the Chief of Engineers (Army), Washington, D. C.
W. J. Hartman, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-016 118, Price codes: A05 in paper copy, A01 in microfiche. Final Report, May 16, 1975. 65 p, 31 fig, 16 tab, 127 ref.

Descriptors: *Waste water treatment, *Land management, *Treatment facilities, *Evaluation, *Land use, Environmental effects, Sites.

A study of historical and current literature on land treatment was conducted to help policy and decision making relative to treating or disposing of municipal waste water. Information is given to aid designers in siting treatment facilities. Evaluations were made of environmental factors and characteristics of potential and current areas served. These characteristics included population size, soils, crops, health hazards, aesthetics, and the rate and quantity of application. Serveral concerns in siting facilities were farm unit density, crop production, present non-farm land uses, topography, animals and vegetation, meteorology, soil moisture, and public involement. Planning goals

cited were consideration of buffer areas, isolation, Preservation of natural resources and farm-municipal cooperation. Land treatment was considered useful for waste water where environmental factors are favorable and area economics can be improved. Scientific teams from varying backgrounds were suggested as designers of treatment systems. (Collins-FIRL)
W77-04635

HUMAN ENTERIC VIRUSES IN A WASTE-RECYCLING AQUACULTURE SYSTEM,
New Hampshire Univ., Durham. Dept. of Microbiology.
T. G. Metcalf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 909, Price codes: A03 in paper copy, A01 in microfiche. Final Report to NSF (RANN), August, 1975. 32 p, 4 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Public health, *Pollutant identification, *Sewerage, *Treatment facilities, Sewage treatment, Viruses, Aquaculture, Recycling.
Identifiers: Waste-recycling aquaculture system.

Potential public health hazards from the use of the aquaculture waste recycling system were evaluated. The treatment system consisted of algal ponds, in which secondary non-chiorinated sewage was mixed with seawater, and raceways stocked with shellfish. Test viruses were Poliovirus II, Echovirus 5, Coxackievirus B-3, Reovirus 1, and type 5 Adenovirus. Results of the two-year study indicated that the system is unacceptable.If a virus-free effluent is desired, without a second virus inactivating process. If virus-free shellfish were to be the parameter of public health acceptance, the full-grown shellfish could be depurated to remove viruses or the sewage effluent could be treated to remove viruses. The system was judged unsafe for use as a means of providing a growth medium for commercially valuable marine life. Futher research was recommended. (Collins-FIRL)
W77-04636

DEVELOPMENT AND APPLICATION OF A SIMPLIFIED STORMWATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Palo Alto, Calif.
J. A. Lager, T. Didriksson, and G. B. Otte.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 074, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/2-76-218. August, 11976. 153 p, 30 fig, 47 tab, 12 ref, 4 append.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Combined sewers, *Mathematical models, Storm water, Overflow, Runoff, Water quality, Model studies, Methodology.

A simplified, inexpensive, flexible stormwater management model for planning and preliminary sizing of storm water facilities has been created. The model delineates a methodology for storm water management and consists of a series of interrelated tasks combining small computer programs and hand computations that can be used either singly or together. It introduces time and probability into storm water analysis, promotes total system consciousness, and assists in establshing size-effectiveness relationships for facilities. Five tasks are included: data preparation, rainfall characterization, storage-treatmet balance, overflow-quality assessment, and receiving water response. A system of combined sewers is analyzed using Rochester, New York, as a working example. A schematic of the existing storm water facilities, outlining major conduits and overflow discharge locations and sizes, is essential to data preparation. Overflow quantities and qualities must be measured for calbrating the model. It is easy to generate frequency of occurrence curves from the ranking of storm parameters. The storage treatment computer program allows quick review of the interrelationship between containment of runoff in storage and the capacity of treatment plants or interceptors. This program, which uses rainfall records for a long period as the data source, can accurately tabulate the quantity, frequency, and duration of overflows. Overflow quality can be predicted based on storm characteristics using linear regression techniques. Gross averages of the quality data by subarea can idicate overflow quality and areal trends. The receiving water analysis provides the final test of a control alternative. (Snyder-FIRL)
W77-04637

ASSESSMENT OF MATHEMATICAL MODELS FOR STORM AND COMBINED SEWER MANAGEMENT,
Battelle Pacific Northwest Labs., Richland, Washington, Water and Land Resources Dept.
A. Bradstetter.
Report EPA-600/2-76-175a, August, 1976. 530 p, 122 fig, 76 tab, 139 ref, 6 append.

Descriptors: *Sewerage, Analytical techniques, *Combined sewers, *Hydraulics, *Hydrology, *Mathematical models, Sewers, Water pollution, Model studies, *Waste water treatment.

Mathematical models for the nonsteady simulation of urban runoff were evaluated for engineering assessment, planning, design, and control of storm and combined sewerage systems. They were evaluated on the basis of information provided by the model builders and users. Most include nonsteady simulation of the rainfall-runoff process and flow routing in sewers; a few include simulation of waste water quality, options for dimensioning sewerage system components, and features for real-time control of overflows during rainstorms. The models evaluated were: British Road Research Laboratory Model, Chicago Hydrograph Method, Colorado State University Urban Runoff Modeling, Corps of Engineers Hydrologic Engineering Center STORM Model, Hydrocomp Simulation Program, Minneapolis-St. Paul Urban Runoff Model, Municipality of Metropolitan Seattle Computer Augmented Treatment and Disposal System, University of Cincinnati Urban Runoff Model, University of Illinois Storm Sewer System Simulation Model, University of Massachusetts Urban Runoff Model, Wilsey and Ham Urban Watershed Model, Battelle Urban Waste Water Management Model, Dorsch Hydrograph-Volume Method, Environmental Protection Agency Storm Water Management Model, Massachusetts Institute of Technology Urban Watershed Model, Metropolitan Sanitary District of Greater Chicago Flow Simulation Program, SOGREAH Looped Sewer Model, and Water Resources Engineers Storm Water Management Model. The last seven were also treated by computer runs using hypothetical and real catchment data. Testing with hypothetical data showed that computer running time is governed more by efficient formulations of the overall model logic than by the basic equations used for specific phenomena. (Synder-FIRL)
W77-04638

METHODOLOGY FOR THE STUDY OF URBAN STORM GENERATED POLLUTION AND CONTROL,
Envirex, Inc., Milwaukee, Wis. Environmental Science Div.
R. E. Wullschleger, A. E. Zanoni, and C. A. Hansen.
Report EPA-600/2-76-145, August, 1976. 342 p, 85 fig, 38 tab, 265 ref.

Descriptors: *Pollutant identification, *Waste water treatment, *Sewerage, *Analytical techniques, *Biochemical oxygen demand, Chemical oxygen demand, Water pollution, Sewage treatment, *Methodology.

Standard procedures are recommended for assessment of storm generated discharges. Major areas of effort include recommended methods for sampling and sample preservation, monitoring instrumentation, choice of quality parameters, analytical procedures, methods for evaluating storm generated discharge pollution, and standard procedures for evaluating treatment processes treating storm generated flows. Choice of the recommended procedures was based on literature, research projects, and experience. Constant time-volume proportional to flow rate sampling is best, but constant time-volume proportional to flow increment and constant volume-time proportional to flow increment are considered acceptable. Ultrasonic level gaging equipment is suitable. The choice of quality parameters includes oxygen demand potential indicator, particularly concentration, pathogenic indicator, eutrophication potential, heavy metals, pesticide and polychlorinated biphenyls, and other characteristics. The relative merits and disadvantages of the 5-day biochemical oxygen demand (BOD), 20-day BOD, BODx, chemical oxygen demand (COD), total organic carbon, and total oxygen demand (TOD) tests are discussed; TOD is best for storm and combined sewer discharges. Fecal coliform is the best indicator of the presence of pathogens. For each quality parameter selected, the exact laboratory procedures are spelled out. The following are recommended for background data for storm generated discharges: drainage area; land usage; population density; pervious and impervious areas; street and curb miles; average daily traffic; methods and frequency of street cleaning; and lengths, sizes, and slopes of sewers. The precautions necessary to insure that true net process efficiency is determined are specified. (Snyder-FIRL)
W77-04640

OVERLAND FLOW TREATMENT OF RAW WASTEWATER WITH ENHANCED PHOSPHORUS REMOVAL,
Robert S. Kerr Environmental Research lab., Ada, Okla.
R. E. Thomas, B. Bledsoe, and K. Jackson.
Available from the National Technical Information Service as PB-257 157, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/2-76-131, June 1976. 44 p, 7 fig, 5 tab, 8 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Biochemical oxygen demand, *Chemical oxygen demand, *Sewage treatment, Land use, Nitrogen cycle, Overland flow.
Identifiers: Phosphorus cycle.

The capability of overland flow to provide complete treatment of raw comminuted waste water year-round in mild climates was evaluated. A 36-month pilot study was conducted at a loading of 10 cm/wk and a special 15-month adjunct on phosphorus removal by chemical precipitation with aluminum sulfate. A well-operated system can produce an effluent with less than 10 mg/liter of suspended solids and biochemical oxygen demand (BOD), while removing 70 to 90% of the total nitrogen. Phosphorus removal is about 50% with relatively minor seasonal variation but can be improved to 90% by precipitation using aluminum sulfate. Data for chemical oxygen demand (COD) and total organic carbon are also covered in detail. Overland flow was shown to be a simple and reliable treatment process. The effluent from the 36 month evaluation was substantially better than established criteria for secondary treatment. (Snyder-FIRL)
W77-04641

NUTRIENT CONTROL BY PLANT MODIFICATION AT EL LAGO, TEXAS,
Harris County Water Control and Improvement District No. 50, Seabrook, Tex.
B. W. Ryan, and E. F. Barth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 772,

Price codes: A06 in paper copy, A01 in microfiche. Report EPAc600/2-76-104, July, 1976. 123 p, 24 fig, 20 tab, 2 append.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Chemical oxygen demand, *Treatment facilities, Waste water(Pollution), Nitrification, Phosphorus, Texas, *Nutrient removal.

An existing small trickling filter plant was modified for advanced waste water treatment. The need for advanced waste treatment at El Lago, Texas, the plant location, is based on the requirements of the Texas Water Quality Board to protect the receiving water, Clear Lake, from excessive pollution by organic carbon, suspended solids, ammonium nitrogen oxygen demand, and phosphorus. All existing facilities of the nominal 0.3 mgd plant were utilized. Phosphorus is controlled by metallic salt addition to the primary settler, carbonaceous removal by trickling filters, and nitrogenous oxygen demand by suspended growth second stage activated sludge. Nitrogen is removed via attached growth column denitrification and tertiary solids by granular media filtration. These processes operate in series. An effluent with the following residual concentrations can be obtained at the design flow of 0.3 mgd: biological oxygen demand, 5 day, 4 mg/liter; chemical oxygen demand (COD), 25 mg/liter; suspended solids, 2 mg/liter; total phosphorus, one mg/liter; and total nitrogenous content, 2 mg/liter. The feasibility of modifying an existing small trickling filter plant to control nutrients in waste water discharge was demonstrated. The conversion to an advanced waste water treatment plant need not disrupt services. Dosing of metallic salts for phosphorus control did not interfere with anaerobic digestion or overland the sand drying bed capacity. Tertiary filtration of effluent to control particulate matter enhanced the visual qualities of the final product. (Snyder-FIRL)
W77-04642

CHARACTERIZATION AND TREATMENT OF COMBINED SEWER OVERFLOWS,
San Francisco City and County Dept. of Public Works, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 299, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-670/2-75-054, April 1975. 202 p, 59 fig, 24 tab, 21 ref, 6 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Sewerage, Storm surge, Combined sewers, Storm drains, Water pollution sources, *Outfall sewers.

Two combined sewer outfall systems, the Selby Street and Laguna Street systems, in San Francisco, were studied. Eight storm overflows were monitored at the Selby Street outfall and two in the Laguna Street system. Monitoring included measurement of rainfall, discharge, and quality characteristics of the overflows. The bacteriological impact of overflows on receiving water was determined by a coliform survey of a segment of the municipal marina adjacent to the Laguna Street outfall. Laboratory tests were conducted to select suitable methods to treat combined sewer overflows. The initial overflow phase is probably caused by flushing of sewage in the lower reaches of the sewerage system. Generally initial overflows have the characteristics of raw sewage. During the second phase, a systematic scouring of materials in the sewer and on the surface appears to occur, and pollutant concentrations usually increase. The concentrations then drop to the steady third phase level. Relatively unpolluted surface runoff and normal sewage flow make up third phase discharges. The discharge rate has little effect on pollutant concentrations. The time of decrease to a steady level is virtually independent of system physiography and meteorological conditions. Differences between combined sewer overflows and urban storm runoff are small. Apparently, separation of sewers would not significantly reduce pollution of receiving waters. Wet weather discharges significantly affected coliform levels in waters proximate to combined sewer outfalls. Disinfecting combined sewer overflows will be necessary for receiving waters to meet recreational water quality requirements. Dissolved air flotation is potentially feasible as a means of treating combined sewer overflows. (Snyder-FIRL)
W77-04644

PROCESS ALTERNATIVES FOR REMOVAL OF CARBONACEOUS, NITROGENOUS, AND PHOSPHORUS MATERIALS FROM CONCENTRATED WASTE STREAMS,
Engineering-Science, Inc., Oakland, Calif. Research and Development Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 125, Price codes: A03 in paper copy, A01 in microfiche. EPA Water Pollution Control Research Series 17010 EVB 11/70, November, 1970. 22 p, 7 fig, 2 tab, 1 ref.

Descriptors: *Waste water treatment, Economics, *Nutrients, Evaluation, *Chemical precipitation, Flow rates, Lime, Iron, Separation techniques, *Carbon, *Nitrogen, *Phosphorus, Costs.
Identifiers: Separation processes, Conversion processes, Alum.

Laboratory studies were conducted to evaluate the performance of separation and conversion processes in treating waste water effluents. Digester liquid was used as a representative waste stream. Economic evaluation indicated that daily treatment costs increased as flow increased, that each ten-fold increase in flow rate produced a seven to nine-fold economic cost. Highly concentrated streams produced lower treatment cost than treatment of diluted waste steams. The use of wet air oxidation reduced solids content and precluded chemical solids conditioning before vacuum filtration, but increased daily treatment costs. It was concluded that presently available technology for evaluating unit process performance can be applied to evaluating waste treatment systems. Some systems proved applicable for waste treatment after cost analysis were: chemical solids and phosphorus conversion, gravity thickening, vacuum filtration and centrifugation, and ammonia air stripping. (Collins-FIRL)
W77-04645

REVERSE OSMOSIS STUDY ON MUST WASTEWATER TREATMENT,
Universal Oil Products Co., San Diego, Calif. Fluid Sciences Div.
J. L. Jennings, and D. H. Furukawa.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-014 270, Price codes: A06 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington, D.C. February 1975. 103 p, 18 fig, 8 tab, 3 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Reverse osmosis, Waste water(Pollution), *Hospitals, Membranes, Organic Wastes, Foaming.
Identifiers: *Hospital wastewater, Non-cellulosic membranes, Air stripping.

A new, non-celulosic, reverse osmosis membrane (NS-100) and one and two stage reverse osmosis recycle operations were evaluated for field hospital waste other than human waste. The test unit consisted of two parallel first stages followed by a second stage that could take feed from either first stage. One first stage contained NS-100 membranes, the other standard cellulose acetate membranes. The second stage contained NS-100 membranes. Various compounds were added as an inter-stage treatment in an attempt to increase organic rejection by the second stage.. With low molecular weight organics passing the membranes, vacuum air stripping was evaluated as a removal method. Foaming was also evaluated for increasing flux and organic rejection. Recycling reverse osmosis was proven reliable and simple for producing reusable water. The NS-100 membrane did a very good job of removing organics, but is not yet suitable for field hospital use. Problems occurred with foulng, cleaning, and fabrication. Two stage operation increased performance over single stage operation, but not enough to justify the additional cost and power consumption. None of the inter-stage treatment compounds significantly improved organic rejection. Foaming the feedwater in a column reduced total organic carbon (TOC) and volatile organic carbon, but not fouling. Air stripping reduced TOC by 50%. (Snyder-FIRL)
W77-04646

LAND APPLICATION OF WASTEWATER: THE FATE OF VIRUSES, BACTERIA AND HEAVY METALS AT A RAPID INFILTRATION SITE,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
S. A. Schaub, E. P. Meier, J. R. Kolmer, and C. A. Sorber.
Available from the National Technical Information Service, Springfield VA 22161 as ADA-011 263, Price codes: A04 in paper copy, A01 in microfiche. Technical Report 7504, May 1975. 57 p, 17 fig, 9 tab, 17 ref.append.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewerage, *Bacteriophage, *Coliforms, Enteric bacteria, Groundwater, Heavy metals, Percolation, *Infiltration, Waste water disposal, Water reuse.
Identifiers: Land application.

Rapid infiltration (RI) land application of waste water was studied to determine if significant quantities of specific microbiological and chemical waste water constituents could percolate into the groundwater. The study had been in operation over 30 yr. Primary sewage effluent was used. Bacteriophage was added to the waste as a tracer virus. Indigenous indicator bacteria concentrations were determined. Samples from five soil layers extending to approximately 30 in. beneath the surface were analyzed for heavy metals. Neither renovated nor unrenovated RI cell soils were capable of adsorbing viruses from primary effluent. Tracer bacteriophage penetrated into the groundwater. The tracer and indigenous enteroviruses were sporadically detected in significant numbers in the groundwater at horizontal distances up to 600 ft from the application point. Fecal indicator bacteria were concentrated on the soil surface, but significant numbers can migrate into the groundwater. They were detected at the same locations as the viruses. A subsurface black layer in unrenovated cells had a high total organic carbon heavy metal content. This layer disappeared several months after sewage application was discontinued. Renovated beds had high total organic carbon and heavy metal accumulation on the soil surface only. Because the groundwater intercepts a polluted river, there is little direct health hazard from the study site. (Snyder-FIRL)
W77-04647

VIRUS ELIMINATION IN WATER AND WASTEWATER,
Naval Coastal Systems Lab., Panama City, Fla.
L. B. Katzenstein, and J. A. Braswell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-021 773, Price codes: A03 in paper copy, A01 in microfiche. Technical Report NCSL 269-76, January 1976. 37 p, 2 tab, 128 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Waste treatment, *Water treatment, Waste water(Pollution), Sedimentation, *Viruses, Public health.
Identifiers: *Virus removal.

Considering the extremely small concentration of viruses necessary for infection, a major sanitary engineering goal is total removal of viruses from water which humans might consume. Major emphasis has been placed on assuring sufficient sewage treatment. The effectiveness of various techniques for disinfecting sewage and drinking water are discussed, emphasizing virus elimination. Disinfection technology currently applied is not adequate to insure that treated water or waste water does not contain harmful viruses. Relatively minor alterations of conventional treatment processes can greatly enhance their effectiveness. Alum and lime can contribute to virus removal by the formation of virus-adsorbing flocs or by adjusting the pH to levels which inactivate viruses. Ferric chloride and other coagulants are also effective. If coagulants are used with sand filtration, the otherwise less effective filtration process can accomplish substantial removal of viruses. Improved mixing can greatly enhance terminal disinfection by chlorination. The quantity of chlorine required can be reduced, reducing the potential hazard of chlorinated effluents. Ozone compares very favorably with chlorine for the elmination of viruses. The state-of-the-art for virus removal through economically feasible treatment of water and waste water appears well ahead of the technology currently being applied. Substantially improved virus removal should be possible at little additional cost to a well-run treatment facility. (Snyder-FIRL)
W77-04648

EVALUATION OF THE USE OF SLUDGE CONTAINING PLUTONIUM AS A SOIL CONDITIONER FOR FOOD CROPS,
California Univ., Livermore. Lawrence Livermore Lab.
D. S. Myers, W. J. Silver, D. G. Coles, K. C. Lamson, and D. R. McIntyre.
Technical Report UCRL-77318, November, 1975. 18 p, 5 fig, 6 tab, 11 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Sewerage, *Treatment facilities, Evaluation, Sludge, Sweet corn, Tomatoes, Melons, Radioisotopes, Water reuse.
Identifiers: *Plutonium, Soil conditioner.

During a 3 wk period approximately 32 mCi of plutonium 239 was inadvertently released into a sanitary sewer system. Sampling confirmed that the Pu239 was essentially all contained in the digested sludge at the sewage treatment plant. In view of the widespread use of sludge as a soil conditioner, possible adverse health implications associated with use of the sludge were studied. Two uptake pathways were studied: resuspension and inhalation of Pu239 from sludge used as soil conditioner, and Pu239 uptake by plants grown in the sludge and subsequent ingestion by people eating the crops. Approximately 13 cu m of the dried sludge was spread 7.5 to 10 cm deep over an experimental plot. After a 4 wk drying period, the soil was rototilled to a depth of about 14 cm. A control plot was rototilled without soil conditioner. The dust cloud generated was sampled with a high-volume Anderson cascade impactor. Dissolution characteristics of the plutonium in body fluids were studied using simulated blood serum. Corn, turnips, broccoli, tomatoes, cucumbers, and melons were raised in the test plot. Harvested vegetables were cleaned using techniques approximating those home gardeners use. Fifty to 100 g of each were chemically digested and counted using alpha spectrometry to determine Pu239 content. Estimated 50 yr radiation doses to the pulmonary region of the lung, bone, and liver from inhalation are 0.00016 rem, 0.0012 rem, and 0.000055 rem, respectively. The 50 yr doses from vegetables were 0.000022 rem to the bone and 0.000015 rem to the liver. The maximum credible 50 yr lung, bone, and liver dose commitments associated with the contaminated sludge are approximately 0.04% of the annual maximum permissible dose. (Snyder-FIRL)
W77-04649

EVALUATION OF ROTARY VACUUM PRECOAT FILTRATION FOR SLUDGE DEWATERING,
Johns-Manville Sales Corp., Denver, Colo. Research and Development Center.
G. R. Bell, and O. A. Wirsig.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 737, Price codes: A06 in paper copy, A01 in microfiche. Final Report 0276-1 to Army Mobility Equipment Research and Development Center, Fort Belvoir, Virginia, January 23, 1976. 110 p, 19 fig, 25 tab.

Descriptors: *Waste water treatment, *Chemical oxygen demand, *Treatment facilities, *Filtration, Carbon, Diatomaceous earth, *Filters, Suspended solids.
Identifiers: Suspended solids removal, *Rotary precoat filtration.

Bench scale studies were performed to determine general areas of feasibility for rotary vacuum precoat filtration (RVPF) and specific conditions for the subsequent pilot plant studies. RVPF provides a means for dewatering sludges containing substantial amounts of finely divided, relatively impermeable solids. It achieved very high suspended solids capture when filtering untreated and chemically pretreated concentrated chemical toilet human waste, Erdlator blowdown sludge, and laundry waste. It removed varying amounts of total organic carbon (TOC) and chemical oxygen demand (COD) depending on the age of the human waste. Filtrate from Erdlator blowdown sludge and laundry waste had the clarity of potable water. Waste cake dry solids from the various sludges ranged from 38 to 51%, averaging about 45%, and would be suitable for landfill or incineration. Design of treatment systems using RVPF would be a matter of incorporating small commercially available components. One modification necessary for human waste filtering would involve a revolving knife to handle the paper fiber content of the waste. An alternative single stage process using RVPF to provide simultaneous solids removal and carbon treatment was demonstrated. (Snyder-FIRL)
W77-04650

WASTEWATER TREATMENT FACILITY EVALUATION, RICKENBACKER AFB OH,
Environmental Health Lab., McClellan AFB., Calif.
C. F. Pauls.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 678, Price codes: A08 in paper copy, A01 in microfiche. Technical Report 76M-1, January, 1976. 165 p, 10 fig, 10 tab, 16 ref, 4 append.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewage treatment, *Sewerage, *Biochemical oxygen demand, Treatment facilities, Biological treatment, Lime, Magnesium carbonate.
Identifiers: Alum.

The waste water treatment facility at an Air Force base was evaluated, including analyzing operating conditions and performance, evaluating past operating records, and preliminary evaluation of techniques that can be applied to upgrade the facility to insure compliance with future discharge limitations. The primary sedimentation basins provided 43% mean biochemical oxygen demand (BOD) removal and 50% mean suspended solids (SS) removal, the latter below that expected for this facility. The trickling filter provided 27% mean BOD removal efficiency; the trickling filter/secondary sedimentation basins combined provided 69% BOD removal efficiency. Mean effluent BOD and SS concentrations were within current National Pollutant Discharge Elimination System (NPDES) specifications; maximum daily effluent BOD exceeded the allowable concentration in two instances. Final effluent fecal coliform concentrations exceeded the allowable maximum 4 of 9 days tested and chlorine residuals 5 of 7. Final effluent pH was acceptable. Mean SS concentrations based on operating logs for the raw sewage, primary effluent, trickling filter effluent, and final effluent were 79, 45, 37, and 18 mg/liter, respectively. Mean BOD concentrations in the raw sewage, primary effluent, trickling filter effluent, and final effluent are 162, 88, 44, and 33 mg/liter, respectively. The BOD removal efficiency of the existing trickling filters can be improved substantially by extending their arms to utilize the full available area and increasing the recirculation ratio. Jar tests indicate that the use of alum, lime, or lime and magnesium carbonate to coagulate and precipitate either the trickling filter effluent or final clarifier effluent will produce an effluent complying with the 1977 NPDES limitations. (Snyder-FIRL)
W77-04651

STORMWATER TUNNEL CUTS DRAINAGE COSTS.
The American City and County, Vol. 91, No. 10, p 54, October, 1976.

Descriptors: *Storm water, Runoff, *Sewers, *Urban runoff, *Drainage systems, Treatment facilities, Cities, Conduits, Conveyance structures, Hydraulic structures, Construction, Design criteria, Storm runoff, Concrete pipes, Tunneling, Materials, Separation techniques, Chlorination, Costs, Indiana.
Identifiers: Indianapolis(Ind).

A stormwater system for the city of Indianapolis, Indiana which is designed to handle periodic flooding and divert overflow from existing combined sewers for treatment is described. The system includes a 22-block-long storm drainage pipe, a treatment facility, and a huge outfall conduit. Stormwater will be collected, channeled north to the treatment facility for solids separation and chlorination, and then pumped into the White River. The design includes an underground sedimentation and contact tank sized to provide slightly more than 15 min contact time at a flow rate of 100 million gallons/day, equivalent to the treatment of 0.5 in of rainfall/hr with a runoff factor of 40%. After storms, the solids and sludge which have been collected in the detention tank will be flushed into a sump and pumped into an existing 42-inch sanitary sewer for further treatment at the city's waste water treatment plant. The sewer system conveying stormwater to the treatment facility will consist of almost 2.5 mi of reinforced concrete pipe, most of which will be installed by tunnel construction down to a depth of 40 ft. Total cost of the project is $5.5 million. (Kreager-FIRL)
W77-04654

FORCE MAIN SEWER LINE USES POLYETHYLENE PIPE.
For primary bibliographic entry see Field 8G.
W77-04659

PLAIN END PIPE MEANS PRODUCTION EFFICIENCY,
For primary bibliographic entry see Field 8G.
W77-04660

SIMULATED FIELD STUDY FOR I/I ANALYSIS,
S. H. Stilley.
Public Works, Vol. 108, No. 1, p 50-53, January, 1977. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Analytical techniques, *Treatment facilities, Infiltration, *Inflow, Sewerage, Hydraulic condictivity, Analysis.

Identifiers: *Infiltration/inflow.

A simulated field study was presented as a guide to infiltration/inflow analysis. Significant factors are: monitoring of significant bypasses and overflow from surcharged manholes, use of weirs to measure gravity sewer flows and recorders for logging flows of an extended period, logging of frequency and duration of each pump operation, monitoring to determine amount of time a bypass operates at a set level, obtaining daily rainfall readings, correlating groundwater levels to flows during wet and dry weather, and analyzing flow data with respect to water consumption, treatment plant flows, rainfall and groundwater levels. Dry weather infiltration is primarily due to high groundwater levels, expressed as the difference between dry weather average flow and calculated waste flow. Wet weather infiltration and inflow are usually extraneous flows entering the system duri ; and after wet weather rainfall, expressed as all flows above average dry weather flow. After determining flows and calculating the I/I, a comparison of alternatives is made to determine the excess I/I and to select a cost-effective plan of improvement. In cost comparison, hydraulic capacities of transmission and treatment facilities are based on capacities necessary to accommodate flows met in the present system, but applied to an expanded system. Not included is a reserve capacity for future growth or I/I greater than that encountered during study period. (Collins-FIRL)
W77-04662

SET SEWER RATES THAT REFLECT USE,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-04663

SEWER CLEANING SYSTEM COMBINES VERSATILITY, LOW INITIAL COST,
Monroe Water and Sewer Maintenance, N. C.
For primary bibliographic entry see Field 8G.
W77-04664

CALIFORNIA CITIES LAUNCH $2 BILLION IN SEWERAGE JOBS.
For primary bibliographic entry see Field 5G.
W77-04665

NO SEWERS--NO GROWTH,
For primary bibliographic entry see Field 5G.
W77-04666

EPOXY MORTAR AND COATING PROVIDE NEW LIFE FOR INVERT.
For primary bibliographic entry see Field 8F.
W77-04667

AUTOMATIC CLARITY CONTROL OF OVERFLOW FROM SEDIMENTATION TANK-WITH SLUDGE PUMP ACTUATED BY PHOTO-ELECTRIC CHECK OF SAMPLE LIQUID.
French Patent FR 2292-505. Issued July 30, 1976. Derwent French Patents Abstracts, Vol. X, No. 41, p J1, November, 1976.

Descriptors: *Patents, *Waste water treatment, *Pollutant identification, *Overflow, *Settling basins, Sludge, Sedimentation, Automatic control.

A patent was issued for a control system and process to ensure proper clarification of overflow of a sedimentation tank. A sample stream of liquid continually passes from the tank at a level below the overflow but as high as permissible suspended particles, and falls through the beam of a photoelectric cell detector system. When particles are detected, sludge pumps are automatically activated. The sample stream is from a pipe which enters the liquid through a side wall between 0.1 and 0.2 meters below the overflow. (Collins-FIRL)
W77-04668

SLUDGE SETTLING BASIN,
Prometall Uznach A.G. (Switzerland). (Assignee).
K. Fux.
United States Patent 3,993,568. Issued November 23, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 4, p 1732, November, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Settling basins, *Treatment facilities, *Sludge, Walls, Channels, Siphons.

A patent was issued for a sludge settling basin. The basin, with an essentially flat floor and vertical walls, has a fixed channel on one wall and a roller-mounted cover for movement over the basin. A siphon tube attached to the cover has a mouthpiece, extending over the entire basin floor, constructed to reduce the cross section of channels from the suction gap to the upper end of the mouthpiece. Tube portions extend up to the mouthpiece directly upward from the adjacent floor to the basin; horizontally and transversely over the basin slightly above the maximum liquid levels; and downward into the channel. There is also a controllable pump. (Collins-FIRL)
W77-04669

WASTE WATER DENITRIFICATION-BY PROCESS COMPRISING BIOLOGICAL DENITRIFICATION AND NITRIFICATION STEPS.
German Patent DS 2339-557. Issued September 30, 1976. Derwent German Patents Abstracts, Vol. X, No. 41, p D3, November, 1976.

Descriptors: *Patents, *Denitrification, *Waste water treatment, *Biological treatment, *Activated sludge, *Nitrification, Nitrogen, Waste water(Pollution).

A patent was issued for a waste water denitrification process. Nitrogen removal is accomplished by feeding waste water first to a further biological nitrification stage. The solid-separation-stage activated sludge and mixed water from the biological nitrification stage are introduced to the further denitrification stage. Oxygen-free conditions which allow anaerobic respiration without anaerobic fermentation are best for the two denitrification stages. Nitrogen removal is highly effective at low temperatures and with feed water containing great amounts of total nitrogen. (Collins-FIRL)
W77-04670

BIOLOGICAL TREATMENT OF EFFLUENT CONTAINING ACTIVATED SLUDGE-INVOLVES CONTINUOUSLY INTRODUCING OXYGEN (CONTG. GAS) AND FEEDING THE OUTLET GAS TO A BURNER.
Belgian Patent BE-839-847. Issued September 22, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 41, p D1, November, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Activated sludge, *Treatment facilities, Air, Sewage effluents, Oxygen.

A patent was issued for an oxygen based biological treatment for effluent that contains activated sludge. The process involves the continuous introduction of air or an oxygen-containing gas into the effluent. The apparatus involves a cylindrical tank with ejectors that receive gas through the pipe. Residual gas passes through the outlet into a burner. Effluent overflows are pumped into the ejectors as a propelling liquid. The overflow used is equal to 10-30% of the gas volume. The oxygen is stripped from the gas in a single absorption stage. (Collins-FIRL)
W77-04671

WASTE WATER PURIFICATION-USING SUPER-PARAMAGNETIC DISPERSED ION-EXCHANGER IN CONSTANT MAGNETIC FIELD,
Ya. N. Svyadoshch, G. P. Alsher, and N. Ya. Lyubman.
Soviet Patent SU-497-027. Issued March 15, 1976. Soviet Inventions Illustrated, Vol. X, No. 41, p D2, November, 1976.

Descriptors: *Patents, *Ion exchange, *Treatment facilities, *Water purification, Waste water(Pollution), Magnetic studies, Liquid wastes, *Waste water treatment.
Identifiers: Paramagnetism, *Magnetic field.

A patent was issued for a waste water purification process using a micro dispersed super paramagnetic ion exchanger. This allows an 8 to 10-fold increase in liquid flows. An example was provided. Eight kilograms of super-paramagnetic cation-exchanger KU-2-8f were placed in a column with an electromagnetic coil having a strength of 350 oersted. A CaC12 solution was passed upwards at 40 specific vols/hr giving a capacity of 2.85 milligrams equivalent per gram. The same capacity by non-magnetic ion-exchange methods requires a rate of 5 specific vols/hr. (Collins-FIRL)
W77-04672

SETTLED SLUDGE REMOVAL.
Australian Patent 475,862. Issued January 3, 1974. Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 32, p 3244, September, 1976.

Descriptors: *Patents, *Sludge disposal, *Waste water treatment, *Treatment facilities, Sludge treatment, Settling basins, Mechanical equipment, Equipment, Conduits.
Identifiers: *Sludge removal.

A patent was issued for a mechanism to remove sludge from the bottom of settling tanks. The apparatus is composed of means to concentrate settled sludge in a localized area on the tank bottom, and conduits from this area to a collection zone. There are also controls for selective operation of these conduits to control flow and range of sludge from the tank bottom to the collection area. (Collins-FIRL)
W77-04673

EFFLUENT WASTE TREATMENT PROCESS AND APPARATUS.
Sphere Inc., Bedford, N.Y. (Assignee).
United States Patent 3,986,955. Issued October 19, 1976. Official Gazette of the United States Patent Office, Vol. 951, No. 3, p 1155, October, 1976. 1 fig.

Descriptors: *Patents, *Treatment facilities, *Effluents, *Waste treatment, *Equipment, Water vapor, *Waste water treatment, Heat exchangers.

A patent was issued for a process and apparatus for treating effluent waste. The apparatus is a self-contained unit with an internal water system. The process consists of passing waste effluent into a collection zone and various heat exchanges where water vapor from the heated effluent is converted to heat for preheating wastes and other heating needs. The solid wastes are sterilized, dried, and stored. After passing through four heat exchanges, the condensed vapor is passed to the system's water supply. (Collins-FIRL)
W77-04674

APPARATUS AND METHOD FOR DENITRIFICATION OF WASTE WATER,
California Inst. of Tech., Pasadena. (Assignee).
H. P. Neff, and J. T. Graham.
United States Patent 3,994,803. Issued November 30, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 5, p 2160, November, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewerage, Treatment facilities, Equipment, *Denitrification.

An improvement is patented in an apparatus for treating sewage with an aeration zone to convert nitrogen-containing compounds in sewage to nitrates, as well as a settling zone to separate a nitrate-containing liquid and sludge produced in the aeration zone, and a filter bed containing anaerobic denitrifying bacteria. The nitrate-containing liquid is charged from the settling zone to the filter. The filter bed is periodically backwashed, including forcing clean water into the bottom of the filter and upwardly through it to a level higher than the surface of the filter bed. The improvement makes it possible to conduct most of the clean water away from the filter by gravity and retain a small portion of it above the bed. This small portion also contains a portion of the colony of bacteria. The flow of clean water is discontinued after a predetermined time. The water in the filter bed can be withdrawn and the small portion of water along with the portion of bacteria released to flow by gravity onto the bed, inoculating it with the portion of the colony of bacteria. A conduit is included, through which the nitrate-containing liquid is conveyed to flush away the small amount of water and portion of the colony of bacteria. (Snyder-FIRL)
W77-04676

TERTIARY FILTER FOR WASTE TREATMENT,
Australian Patent 475, 789. Issued September 2, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 46, No.32, p 3227, September, 1976.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, *Tertiary treatment, *Filters, Liquid wastes, Outlets, Flow, Diversion, Filtration.

A method for filtering liquid was patented. Two filter beds are positioned in outlets in containers. The flow of liquid being filtered is directed through one filter bed. The liquid level in each container is sensed. When the liquid level in the container holding the first filter bed exceeds a predetermined value, flow of liquid being filtered is diverted through the other filter bed. The flow of unfiltered liquid is transferred. The solid contaminanat particles are removed from the first filter bed while flow of liquid is maintained through the second filter bed. Flow of liquid is directed through the first bed when the liquid level in the container holding the second filter bed exceeds a predetermined value. Liquid is transferred, and contaminant particles are removed from the second bed while liquid flows through the first. (Snyder-FIRL)
W77-04677

SCREENING APPARATUS FOR REMOVAL OF SOLIDS - FROM SEWAGE WITH ROTATING SCREEN AND VERTICAL LIFT FOR RESIDUES,
Netherlands Patent NL 7604-312. Issued October 26, 1976. Derwent Netherlands Patents Report, Vol. X, No. 46, p D6, December, 1976.

Descriptors: *Patents, *Filtration, *Sewage treatment, *Waste water treatment, Sewage effluents, Separation techniques, Suspended solids, Waste disposal, *Screens, Solid wastes.

A patent was issued for an apparatus to remove solids from sewage flow or other liquids. Solids are trapped on the face of a cylindrical screen with a vertical axis placed in the liquid flow. The screen can be fixed or rotated by a motor. At its side, there is another screen, composed of vertical rods which rise above the level of fluid flowing throught the device. A lifting mechanism related to the second screen is moved up and down by a hydraulic ram. When rising, the mechanism captures solids which remain on the second screen and pushes them into a compresion chamber. Screening is continuous and effective. (Collins-FIRL)
W77-04678

SEWAGE SLUDGE IRRADIATION SYSTEM-APPLYING ELECTRON BEAM BEFORE MIXING GAP BETWEEN ENDLESS BELTS MOVING AT DIFFERENTIAL SPEED.
French Patent FR 2291-946. Issued July 23, 1976. Derwent French Patents Abstracts, Vol. X, No. 39, p D3, November, 1976.

Descriptors: *Patents, *Sludge treatment, *Irradiation, *Sewage treatment, Bacteria, Sterilants, Fertilizers, Odor, Pathogenic bacteria, Worms, Sewage sludge, *Waste treatment.

A patent was issued for a sewage sludge irradiation system. The sludge is sterilized by radiation just ahead of the gap between two endless belt conveyors, moving at different speeds. The irradiated layers are mixed with less affected lower layers in the gap. The process pasteurizes sewage sludge before its use as manure and there is no ordor problem. There is no need for an additional paddle mixer. This process kills all bacteria, worms, and pathogens. (Collins-FIRL)
W77-04679

ROTARY DRUM EVAPORATIVE DRYER ESPECIALLY FOR SEWAGE SLUDGE - CONTROLS DRYING FILM THICKNESS BY ADJUSTING INCLINATION OF DRUM AXIS,
Netherlands Patent NL 7603-913, Issued November 1, 1976. Derwent Netherlands Patents Report, Vol. X, No. 46, p D5, December, 1976.

Descriptors: *Patents, *Sludge treatment, Solid wastes, Evaporation, *Drying, Overflow, Treatment, *Waste water treatment, Wastes, *Dehydration.
Identifiers: *Dryers(Sludge).

A patent was issued for a rotary sewage sludge dryer. Sludge is applied to the inside circumferential wall and evaporated by a heater inside the drum. A means is provided for removing dried residue. The hollow interior is tapered concically on a longitudinal axis and is open at the large end. The drum should be mounted on a privot in order to adjust it axis to the horizontal. Wet sludge is fed into the drum via the large end at the bottom of its circumference. Film thickness is adjusted by tilting to make surplus sludge flow back to overflow the mouth of the drum. (Collins-FIRL)
W77-04680

AEROBIC TYPE SEWAGE DIGESTION SYSTEM,
J. E. Prince, F. E. Terry, and W. H. Mullins.
United States Patent 3,997,437. Issued December 14, 1976. Official Gazette of the United States Patent Office, Vol. 953, No. 2, p 718, December, 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Aerobic treatment, *Waste water treatment, Pumps, Filters, Filtration, Sludge treatment, Digestion, Overflow.
Identifiers: Supernatant, *Aerobic sewage digestion.

A patent was issued for an aerobic sewage disgestion system. The system is composed of a primary state which receives sewage from a screened headworks into a primary clarifier. After settling to the bottom of the clarifier, sludge is carried to a sludge digester. A secondary stage involves a filter which receives overflow from the primary clarifier which is then passed to another clarifier for additional treatment and discharge of separated liquids. The sludge digester contains a pump for continual sludge circulation, an aerator which discharges above the sludge level and a means for controlling sludge additions by the aerator. There is also a supernatant overflow mechanism and a means for periodically removing digester sludge. (Collins-FIRL)
W77-04681

ACTIVATED SLUDGE TREATMENT-PASSING ALL SEWAGE BY FORCE PUMP THROUGH ATMOSPHERIC AIR ENTRAINING ENJECTORS INTO ACTIVATION TANK,
Belgian Patent BE 843-613. Issued October 18, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 46, p D2, December, 1976.

Descriptors: *Patents, *Sludge treatment, *Activated sludge, Oxygen, Pumps, Sewage effluents, Hydraulic machinery, Water purification, *Waste water treatment, Closed conduits.

A patent was issued for an activated sludge treatment process which ensures the introduction of maximum required oxygen into the activatd sludge-effluent mixture without air compressors. The liquid-sludge mixture is circulated in a closed circuit channel, pressurized by a pump and passed through at least one injector with an inlet exposed to the atmosphere. Air is introduced to the liquid by a downward sloping jet and caused to circulate around the closed circuit. The effluent to be purified is delivered to the channel only by the pump unit and the injector or injectors. (Collins-FIRL)
W77-04682

STIRRING APPARATUS FOR WASTE WATER PURIFICATION - BY INJECTION OF GAS IN BIOLOGICAL TREATMENT TANK,
Belgian Patent BE 843-751. Issued November 3, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 47, p D2-3, January, 1977.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Sludge, Oxygen, *Water purification, Sludge treatment, Sewage treatment, Air circulation, Gases, Aeration, Oxidation, Supersaturation.

A patent was issuded for a stirring device to be used in waste water purification. The device consists of a central cyclindrical body with a cone-shaped extension capped by an ovoid element that has an inlet from the biological tank to the device. The circular unit admits atmospheric air. The body extends downward by the conical part and a paddle-wheel, driven by the shaft, is mounted in the lower body. When immersed in a treatment tank with a biological bed, the vortex is produced and the water drawn in tends to stick to the walls of element and absorb much of the oxygen in the air entering through the inlet. The water moves down the walls and joins the vortex. Supersaturation of the water with air creates a great degree of expansion at a certain tank level, resulting in intense rising currents which bring the sludge into suspension. This promotes excellent oxygen circulation in the mass which provides excellent conditions for the biological elements. (Collins-FIRL)
W77-04683

PRIMARY SURVEY OF THE INVENTORIES OF RURAL PUBLIC UTILITIES (PREMIER APERCU SUR LES INVENTAIRE DES EQUIPMENTS PUBLICS RURAUX),
C. Basalo.
Techniques et Sciences Municipales-L' Eau, No. 8-9: 363-368, August-September, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Rural areas, *Public utilities, Sewers, Human population.
Identifiers: *France.

The inventory of rural public utilities in France shows that sewer systems are now serving 32% of the population compared to 23% in 1971 and that the adjustion of purification plants has risen from 12% (in 1971) to 22%. An estimated 8 billion francs will be spent to add to the sewer system and 2 billion to expand purification facilities. It is estimated that the immediate needs of ghe growing communities will be met within 10 years. The capacity for rural sewage treatment has recently risen from that for 4,180,000 inhabitants to 9,500,000. At present, out of 28,000,000 inhabitants who could be served by communal facilities, only 19,500,000 are so served. (Waltner-FIRL)
W77-04684

BIOLOGICAL PURIFICATION OF URBAN WASTEWATERS BY MEANS OF ROTATING BIOLOGICAL DISKS (EPURATION BIOLOGIQUE DES EAUX USEES URBAINES AU MOYEN DE DISQUES BIOLOGIQUES TOURNANTS),
B. H. Tan, M. Giffard, and G. Martin.
Techniques et Sciences Municipales-L'Eau, No. 6:281-284, June, 1976.

Descriptors: *Waste water treatment, *Biological treatment, *Pollutant identification, *Biochemical oxygen demand, *Chemical oxygen demand, Treatment facilities, Water purification, Cities, Municipal water, Municipal wastes.
Identifiers: *Rotating biological discs, *France(Rennes).

For six months, the municipal waste waters of Rennes were fed into a pilot biological purification plant consisting of two drums, each with eleven rotating biological polystyrene disks. The total functional surface of the disks was 130 sq m and the total immersed surface 56 sq m. The rotating speed was 2 rpm and total volume 690 liters. Eight flow rates were tested. Charted results show that BOD, COD, and N-NH4+ can be effectively reduced by this process. About 50% nitrification can be achieved in 2 hours whole time with a load of 25,000 sq m/cu m/min. The BOD5 load per liter of growth on the disks is 7.2 g compared to 7.7 g in conventional bacterial beds. The advantages of rotating biological disks are a predictable yield, a good tolerance to toxic substances, easy maintenance, and a short whole time. (Waltner-FIRL)
W77-04685

TECHNICAL ASSISTANCE FOR OPERATORS OF PURIFICATION PLANTS IN THE SEINE-NORMANDIE BASIN (ASSISTANCE TECHNIQUE AUX EXPLOITANTS DES STATIONS D'EPURATIONS DANS LE BASSIN SEINE-NORMANDIE),
R. Pinoit.
Techniques et Sciences Municipales-L'Eau, No. 8-9:363-368, August-September, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Operations, *Water purification, *Personnel, Industries, Training, Operation and maintenance.
Identifiers: Normandy, *France(Seine-Normandy basin).

Free technical assistance to purification plants in communities and industries have been available in lower Normandy since 1971. Technicians visit a plant four times a year to check, correct, and improve the facility. Two days sessions are held for plant operators to teach them more about the plant; they are also made to participate in practical demonstrations and tests. This technical assistance system has aroused more interest in operators for their jobs and has improved overall functioning of the plant by approximately 10%. (Waltner-FIRL)
W77-04686

DEVELOPMENTS AT WATER RESEARCH CENTRE.
Process Biochemistry, Vol. 11, No. 9, p 24-25, September, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Treatment facilities, *Research and development, Research facilities, Projects, Laboratories, Investigations.
Identifiers: *Water Research Centre(Stevenage-Eng UK).

Several projects viewed at an open-house of the Stevenage Laboratory of the Water Research Centre were discussed. Investigations suggested the use of flotation as an alternative to conventional upflow clarification of potable water, a sedimentation alternative, and a clarifier of sewage effluent and sludge thickener. Methods of improving overloaded sewage treatment facilities were also discussed. These included the adoption of alternating double filtration or effluent recirculation, the use of plastics, and proposals for upgrading the performance of biological filtration plants. Oxygen injection in rising-main sewers was also studied. There were continuing investigations of sludge treatment. The use of polyelectrolyte dosing and slow stirring to thicken alum sludge and the disposaal of waterworks sludge to sewers were under investigation. The Centre also undertook the study of means for co-ordinating analytical data for determining and maintaining water quality standards. (Collins-FIRL)
W77-04688

DIFFUSION COEFFICIENT OF OXYGEN IN MICROBIAL AGGREGATES,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
K. F. Ngian, and S. H. Lin.
Biotechnology and Bioengineering, Vol. 18, No. 11, p 1623-1627, November, 1976. 3 fig, 1 tab, 11 ref.

Descriptors: *Waste treatment, *Biological treatment, *Aerobic treatment, *Oxygen, *Transfer, Microorganisms, Diffusion, Kinetics.
Identifiers: Oxygen transfer, Fick's Law, Michaelis-Menten equation, Lineweaver-Burke plot.

The question of oxygen transfer in microbial aggregates is of interest for biological waste treatment and aerobic fermentation processes. If oxygen is transferred within microbial aggregates by diffusion, as it is assumed, the transfer can be described by Fick's law. Various experimental approaches to determine the diffusion coefficients have been tried; they all indicate that the diffusion coefficient of oxygen in the microbial aggregates is less than that in water. A convenient method recently proposed for evaluating the diffusion coefficient assumed that oxygen uptake by the pellets can be described by a Michaelis-Menten type equation, according to which initial oxygen concentration can be plotted against the half-life of oxygen concentration to yield the desired coefficients. However, this equation is only valid in the absence of mass transfer resistance, and the presence of this factor has been detected, especially at low growth medium agitation speeds. The kinetic parameters can be evaluated directly from the oxygen uptake and concentration with a Lineweaver-Burke plot and can then be used to determine the diffusion coefficient. The agitation speed should be kept as low as possible and small pellets used to minimize pellet break-up effects. A diffusion coefficient ratio (diffusion in pellet compared to diffusion in water) of 0.525 was obtained. Thus, the method of Miura et al was sound, and can be useful if the proper experimental conditions are selected. (Collins-FIRL)
W77-04689

AWT AT WOODLANDS, TEXAS,
Houston Univ., Tex. Dept. of Civil Engineering.
J. V. Matson, W. A. Callegari, and M. R. Hassan.
Water and Wastes Engineering, Vol. 13, No. 12, p 22-25, December, 1976. 1 fig, 3 tab.

Descriptors: *Waste water treatment, *Tertiary treatment, *Sewage effluents, *Recycling, *City planning, Irrigation systems, Watershed management, Algal control, Chlorination, Ozone, Lime, Phosphorus, Texas.

Innovations in the water treatment system of Woodlands, Texas were presented and discussed. As a HUD new community project, the system was desinged after extensive ecological and environmental planning. Treated waste water will be recycled into a lake which will serve as a recreational facilty and a reservoir for irrigation and domestic waters. Thus, a high quality effluent is required. The system consists of four process stages: activated sludge, lime precipitation, pressure filtration, and parallel ozonation and chlorination facilities. Sludge treatment is handled by an aerobic digester, thickener, and vacuum filter. Construction is in four stages with completion in the mid-1980's. The system is designed to handle a population of 150,000. Lime precipitation is used to remove phosphorus in order to prevent excessive algae growth. Ozone was used to control chlorine levels and for disinfection. The plant is provided with an emergency power generator. (Collins-FIRL)
W77-04690

SODIUM BICARBONATE AIDS PLANT SWITCHOVER,
Water and Wastes Engineering, Vol. 13, No. 12, p 17, December, 1976.

Descriptors: *Waste water treatment, *Sewerage, *Sewage treatment, *Digestion tanks, *Alkalinity, Sludge digestion, Methane, Sodium compounds, New Jersey, Treatment facilities.
Identifiers: *Sodium bicarbonate.

Sodium bicarbonate was used to solve digester souring problems in a New Jersey sewage treatment plant during a changeover from primary to secondary treatment. Problems occurred when plant capacity was doubled and the new treatment system added to meet new demands and EPA stanards. Alkalnity washout resulted from inadequately thickened sludge and a 12 ft high scum blanket formed and disabled some digester piping. Production of methane gas, used for digester temperature regulation, was reduced from 25,000 (winter) and 40,000 (summer) cu ft/day to as low as 465 cu ft/day. This caused the use of much expensive natural gas. The addition of one to three hundred pound bags of sodium bicarbonate daily for two months countered these problems. Alkalinity increased from under 2000 milligrams/liter with a pH of 5.4 to 4000 milligrams/liter with a pH of 7.0. With this stabilization, methane production went as high as 49,000 cut ft/day and the use of natural gas was reduced by 98%. (Collins-FIRL)
W77-04691

KEEPING UP WITH SLUDGE AT WPCF,
W. J. Storck.
Water and Wastes Engineering, Vol. 13, No. 12, p 35-37, December, 1976.

Descriptors: *Sludge treatment, *Sludge disposal, Economics, *Anaerobic digestion, *Dewatering, Drying, Incineration, Social aspects, Legal aspects, Political aspects, Technology, Conferences, Waste water treatment, *Waste treatment.
Identifiers: Basic Extractive Sludge Treatment.

A review of issues discussed at the Water Pollution Control Federation annual conference was presented. Sludge treatment and disposal and a variety of related topics were treated by persons involved in various projects. One discussion on the economics of energy use and recovery in sludge dispoal was concerned with the influence of

different sludge handlng and disposal methods on energy consumption and total plant capital and operating costs. It was concluded that incinceration will continue to be economically viable, but more effective heat recovery will be necessary. Another discussion indicated that anaerobic digestion is again becoming popular because it is economical and technical advances can easily devise more stable systems. A dewatering economcy was suggested in the use of a combined gas turbine and dryer energy sharing proposal. The Basic Extractive Sludge Treatment (B.E.S.T.) system was evaluated. It dewaters and dries many types of inorganic and organic sludge to produce 95% dry, pathogen-free solids, clear sterile water, and it recovers greases and oils. Various land applications of wastes were considered for treating waste water. Finally, the effects of various legal, social and political considerations on the development of treatment systems was discussed. (Collins-FIRL)
W77-04692

WASTE WATER TREATMENT BY HEATED ROTATING BIOLOGICAL DISCS,
Southern Illinois Univ. at Carbondale. Dept. of Thermal and Environmental Engineering.
D. S. Prensner, C. B. Muchmore, R. A. Gilmore, and A. N. Qazi.
Biotechnology and Bioengineering, Vol. 18, No. 11, p 1615-1621, November, 1976. 3 fig, 3 tab, 11 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Sewage treatment, *Sewerage, *Treatment facilities, Microbial degradation, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: Mesophilic organisms, Thermophilc organisms, *Biological discs.

Investigations were performed to find means of improving the performance of rotating biological discs in the treatment of waste water. Treatment in usually performed at 68 F where mesophilic organisms metabolize wastes. Studies have shown that operation at temperatures about 131 F, where thermophilic organisms with a higher metabolic rate predominate, is more efficient. In this study, two identical disc systems were used; one was heated and the other maintained at 68 F. Actural domestic sewage was used in the experiment. Results indicated that, at 86 and 131 F, COD and BOD removal was much higher than with the 68 F system. At 131 F, BOD and COD removal of 86 and 80%, respectively, was achieved. Biological activity on the discs was instrumental in degrading wastes. (Collins-FIRL)
W77-04693

HOW TO KEEP AN OLD PLANT RUNNING,
Water and Sewage Works, Vol. 123, No. 12, p 71, December, 1976.

Descriptors: *Anaerobic digestion, *Sludge treatment, *Waste water treatment, Digestion, *Treatment facilities, Sodium compounds, Bicarbonates, Hydrogen ion concentration, Methane, Lime, Temperature, Alkalinity, New York.
Identifiers: Digester souring, Tonawanda(NY), Sodium bicarbonate.

A two-year souring cycle in the anaerobic sludge digester was recently broken at the Tonawanda, New York, sewage treatment plant. A sodium bicarbonate treatment consisting of a 500 pound/week spring dosage and the use of a combination of NaHCO3 and soda ash or continued sodium bicarbonate dosing on a year-round basis were instrumental in discontinuing the souring. A stable pH of 7 has been maintained. A drop in methane production was the first indication of souring and caused increased acid formation and a drop in pH. The effect snowballed until pH reached 6.5 or lower where methane formation is impossible. To a plant where methane gas fuels the digester, this was a major problem. The poor solubility of lime and the lengthy period it took to raise pH, as well as a stabilization problem made it a poor solution. It was estimated that 15 tons of sodium bicarbonate are used yearly. Temperature drops do not affect bicarbonate and it performs well where lime was poor. (Collins-FIRL)
W77-04694

OPTIMIZATION OF MULTISTAGE SECONDARY CLARIFIER,
Seelye, Stevenson, Value, and Knecht, New York.
C. R. Lee, L. T. Fan, and T. Takamatsu.
Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2578-2589, November, 1976. 13 fig, 1 tab, 32 ref, 1 append.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Optimization, Model studies, Sewage treatment, Efficiencies, Simulation analysis.
Identifiers: *Clarifiers.

Modeling, simulation, and optimization of the removal efficiency of the secondary clarifier were undertaken. Investigations were aimed at the determination of optimal operating conditions, geometry, and allocation of the compartment volumes. Results showed that the multistage system was more efficient and produced a more stable effluent. Volume or detention time are not major considerations, if there is no scouring, of removal efficiency in either clarifier type. (Collins-FIRL)
W77-04695

MANY DESIGN PROBLEMS OVERCOME IN STATEN ISLAND PLANT,
Pirnie (Malcolm), Inc., White Plains, N.Y.
R. D. Mitchell.
Water and Wastes Engineering, Vol. 13, No. 12, p 57-59, 68, December, 1976. 1 fig, 1 tab.

Descriptors: *Activated sludge, *Design, New York, *Aeration, *Sewage treatment, *Waste water treatment, *Treatment facilities, Air, Regulations.
Identifiers: Port Richmond(NY).

Various problems received unusual solutions in the upgrading of the Port Richmond, New York City, waste water treatment plant. The original extension plan provided for a modified aeration process without primary settling. With changes in federal regulations, alteration to a step aeration activated sludge process was necessary. It was also necessary to provide continued operation of the primary plant until the new one was ready. Additional problems included laying lines under an elevated railway. Criteria for design included: plant operation with step aeration and provisions for use of activated aeration, aeration by fine-bubble diffused air, covered liquid surfaces, grit removal with sludge in primary settling tanks and separation from sludge by cyclone separators, hauling of screenings to disposal areas, and that sludge be digested and barged to sea. The plant features a hypochlorite disinfection system and the use of gas produced in boilers to provide space heating and sludge heating. (Collins-FIRL)
W77-04696

SEWAGE TO AID CITY POWER PLANT.
The American City and County, Vol. 91, No. 12, p 25, December, 1976.

Descriptors: *Water reuse, *Sewage treatment, *Sewage effluents, *Waste water treatment, Filtration, Chlorination, Electric powerplants, Automatic control, Cooling water, California, Recycling, Phosphorus.
Identifiers: *Phosphate removal, Cooling tower make-up water, Glendale(Calif).

A 5.7 mgd phosphate removal facility is being built by the City of Glendale, California, to process effluent from a new water reclamation plant for use as cooling tower makeup water for its power plant. It involves a physical-chemical phosphate stripping process which upgrades incoming filtered secondary effluent through the addition of alum or sodium aluminate, flocculation, precipitation of aluminum phosphates, and final filtration in a dual granular media filter. Polymers will be added for aiding flocculation and chlorine added to inhibit slime growth. Plant equipment includes solids contact clarifier, chemical feed systems, dual media filter, spent backwash holding reservoir, a pumped distribution system, and an automatic control system. Automatic operation is a feature of this project. (Collins-FIRL)
W77-04697

WHITHER VILLAGE SEWAGE,
J. Pullin.
Surveyor, Vol. 148, No. 4407, p 9-11, November, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Sewerage, *Sewage disposal, *Sewage treatment, Economics, Pipes, Rural area, *Treatment facilities, Regional analysis.
Identifiers: *Regional treatment plants, England.

The problem of handling sewage in rural England is approached from two viewpoints. These involve using either regionalized sewage treatment facilities or individual community plants. On an economic basis, costs varied from 404 to 788 pounds per property for a regional system and 375 to 1,498 pounds per property for a community system. Financing procedures and sources are being re-evaluated. Future trends point towards larger regionalized schemes. On the basis of size, regional plants have several advantages: full-time attendants to quickly detect malfunctions, electronic monitoring that is too expensive for smaller plants, designed-in flexibility in larger plants, and minimalization of natural diurnal variations in flow. Disadvantages include the problem of bacterial slime build-up on pipes in a longer pipeline for regional systems and the fact that additions to either system would cost about the same. Examples were given of various rural systems, some of which use activated sludge processes, even in small plants. It was concluded that there is no one plan which could be recommended for all rural areas. (Collins-FIRL)
W77-04698

EFFLUENT AND WATER TREATMENT: THE ECONOMICS OF LIME DOSING AND IN-HOUSE WASTE TREATMENT.
Surveyor, Vol. 148, No. 4407, p 7, November, 1976. 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Lime, *Activated sludge, Capital costs, Operating costs, Sedimentation, Waste water disposal, Water reuse.
Identifiers: Industrial in-house treatment.

Data from experimental plants at Stevenage and Coleshill, England, were used to evaluate the economics of lime in waste treatment and industrial in-house waste treatment was discussed. Costs were evaluated for the treatment of a flow of 45,000 cu m/day in plants using conventional treatment and those using different quantities of lime. Results showed that substantial savings were achieved in capital and operating costs when lime was used in activated sludge treatment. High costs for lime and sludge dewatering or disposal outweighed savings with high-dosage lime treatment. Plants using lime doses of 25, 50, 100, and 200 milligrams/liter had lower costs than conventional treatment plants with filter presses operating at 29 cycles/week. With 14 cycles/week or sludge disposal to land, all but the 100 milligrams/liter dose were cheaper than conventional treatment

and disposal. Lime use with systems where primary sedimentation is the only treatment appear to provide the greatest advantages. With in-house waste treatment, increasing costs and effluents to be disposed suggest that reducing the amount of waste water needing treatment should be a primary objective. Options available to companies include: having some or all effluent treated at local sewage facilities; minimizing waste by changing processes, reclamation of wastes and reuse of water or waste materials; separating solids or highly contaminated wastes from main waste stream; and pretreating waste partially or to a standard acceptable for river discharge. (Collins-FIRL)
W77-04699

SLUDGE BULKING CONTROL WITH BICARBONATES,
Water Pollution Control Facility, Cohasset, Mass.
M. Salvador.
Public Works, Vol. 108, No. 1, p 65, January, 1977.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Sludge treatment, *Sodium compounds, Aeration, Settling basins, Biochemical oxygen demand.
Identifiers: Alum, *Sodium bicarbonate, *Sludge bulking control.

Alum treatment was replaced by sodium bicarbonate as a cure for sludge bulking in a Cohasset, Massachusetts, activated sludge waste water treatment facility. The use of alum temporarily cured the problem but caused a pH drop from 6.9 to 5.0. Attempts at control by lime and caustic soda created problems with stabilization. Alum was discontinued to allow a return to equilibrium and sodium bicarbonate was added, at a dosage of 10 lbs/day, to the aeration tank, settling basins, and chlorine contact chamber. Within four weeks, the pH of these components increased from 6.5-6.8 to stability at about 7.0 with an alkalinity of 250 milligrams/liter. Bulking stopped, while BOD, and settleable and suspended solids removals increased. The suspended solids content of the effluent decreased from a high of 257 milligrams/liter to an average of 25 milligrams/liter and BOD removals increased from 65% to 90%. Sodium bicarbonate, one grain per gallon, is still added for pH control. Dosage is doubled at a pH of 5.8 or lower. (Collins-FIRL)
W77-04700

SOLVING AN INTERIM PROBLEM OF TREATMENT PLANT OVERLOAD,
Santa Barbara Dept. of Public Works, Calif. Water Resources Div.
M. P. Hopkins, and D. Burstein.
Public Works, Vol. 108, No. 1, p 62-63, January, 1977. 1 tab.

Descriptors: California, *Effluents, *Waste water treatment, *Hydraulics, *Sludge digestion, Pipes, Sludge disposal, *Treatment facilities.
Identifiers: Santa Barbara(Calif).

A 'problem-solution' approach was used to determine necessary changes for upgrading Santa Barbara, California, waste water treatment facilities. Additional concerns included the prohibition of ocean disposal of sludge, stricter effluent limits for settleable and suspended solids, inability of handling more than 8 mgd flows, and the poor condition of the submarine outfall. Hydraulic overloading was controlled by five corrective measures. A Barminutor was used in a bypass channel to increase comminuting capicity during high flows. Manually cleaned bar racks were used to prevent large objects from entering comminuting facilities. Influent pumps were overhauled for increased capacity and efficiency. A portable pump was installed to aid influent pumps during heavy flows. Twenty and twenty-four inch pipes were used to connect clarifier effluent throughs and the effluent structure was raised to accommodate peak flow heads. Clarifier performance was improved by installing new baffle systems for basin influent and effluent, installing new effluent weirs in the clarifiers, regrouting each basin bottom, installing new scum scrapers, and adding polymer feed systems to aid settling. New chlorination equipment was installed. Sludge digestion was improved by replacing digester feed pumps with plunger type pumps, installing am added sludge recirculation pump, installing a new digester gas mixing compressor, and replacing most of the digester gas piping. Several general safety hazards were also corrected. With these changes, performance met new standards, operational costs were reduced, and the new equipment could be used in a new facility. (Collings-FIRL)
W77-04701

OZONE MAKERS HOPE TO REPLACE CHLORINE IN SEWAGE USES.
Chemical Marketing Reporter, p 7, 17, November 22, 1976.

Descriptors: *Sewerage, *Treatment facilities, *Prototypes, *Waste water treatment, *Sewage treatment, *Ozone, Chlorination, Economics, Massachusetts, Disinfection.
Identifiers: Marlboro(Mass).

An EPA contract was awarded for a prototype ozone disinfecting system at a sewage treatment plant in Marlboro, Massachusetts. A new approach involves ozone generation by a high-volume electron beam generator directly in untreated air. It was estimated that a one million gallon per day discharge can be treated. The system is expected to be cheaper than chlorination systems being used, producing ozone at a price of 4 to 8 cents per pound. Ozone is an attractive alternative because of the higher cost of chlorine and problems related to its use as well as its toxicity. This method is expected to produce up to thirty pounds of ozone an hour and only two to five pounds are needed to treat the proposed daily output. Savings in energy, plastic, and rubber are expected due to the fact that ozone oxidizes at room temperature. Accelerators developed a beam which produces ozone from untreated air at a cost of less than 10 cents per pound. The generator is combined with a purification device. This system is estimated to reduce by 67% this present ozone treatment energy costs of 30 cents per pound of ozone. Related equipment costs are also reduced over costs with conventional ozone treatment systems. (Collins-FIRL)
W77-04702

RECONCENTRATION OF POLIOVIRUS FROM SEWAGE,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
S. Farrah, C. Wallis, P. T. B. Shaffer, and J. L. Melnick.
Applied and Environmental Microbiology, Vol. 32, No. 5, p 653-658, November, 1976. 1 fig, 6 fig, 7 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Viruses, Adsorption, Anion exchange, Organic compounds, Filtration, Carbon.
Identifiers: *Viral reconcentration, Metal ions, Aquella virsu concentrator, Tetrasodium ethylenediaminetetraacetate(EDTA).

A study was carried out to determine optimal conditions for reconcentration of viruses adsorbed from sewage. A type 1 poliovirus was added to sewage effluent, concentrated by an Aquella virus concentrator, and this mixture is clarified to remove solids. The clarified effluent is treated with acid and A1C13 for a pH of 3.5. This fluid was passed through virus adsorbents and the virus was eluted from the adsorbents. The eluted virus was readsorbed to a series of filters. Results indicated that organic compounds and metal ions can be concentrated during viral concentration using the Aquella virus concentrator. While processing relatively clean water, adsorbed viruses can be reconcentrated on smaller membranes. This is a simple procedure, though reconcentration of eluates from filters that process sewage effluents is problematical. At low pH, the organic compounds and metal ions form flocs and clog the filters used for reconcentration. Solving this problem by using tetrasodium ethylenediaminetetraacetate (EDTA) created problems of interference with viral adsorption to the smaller filters. Reconcentration on smaller filters was effective when carbon and ion-exchange resins were used to remove organic compounds. With this procedure, a mean recovery of 40% of the initial virus count was achieved. A very clean final concentrate was obtained since most organic compounds were removed by carbon and anion-exchange resins. (Collins-FIRL)
W77-04703

RISING TO SEWAGE PROBLEMS.
Materials Reclamation Weekly, Vol. 128, No. 22, p 25, November, 1976.

Descriptors: *Sewerage, *Treatment facilities, Pollutant identification, *Sewage, *Gravity, Pipes, Sewage treatment, Pipe flow, *Waste water treatment.
Identifiers: Electromatic sewage ejector, Sewage screening.

The gravity-filled Electromatic Sewage Ejector was used to alleviate a sewage flow problem involving blocked suction pipework and pump casings at a hospital. The problem inflow consisted of items from clothes to toys. Correction included installation of an ejector system which was 50% more efficient than regular systems which had capabilities of up to 81/sec (100 gpm). A screening apparatus was developed for the inlet chamber of the main sewer to handle the large amounts of previously unscreened waste. The system works by air displacement and is said to be more effective than rotary valve or electrode control units. Materials entering cause air to pass through nylon transfer tubes to a switch which operates a solenoid when closed. Air passes from the receiver into the ejector body and reduces grease or crude sewage problems. (Collins-FIRL)
W77-04704

GENERATION OF ELECTRICAL ENERGY FROM MUNICIPAL REFUSE AND SEWAGE SLUDGE,
Burns and McDonnell, Kansas City, Mo.
For primary bibliographic entry see Field 3E.
W77-04705

CONSIDERATIONS FOR ELECTRICAL DESIGN IN SEWAGE LIFT STATIONS,
For primary bibliographic entry see Field 8C.
W77-04706

SUBSURFACE APPLICATION SOLVES COMMUNITY'S SLUDGE DISPOSAL PROBLEM.
Public Works, Vol. 107, No. 12, p 67-68, December, 1976.

Descriptors: *Sludge treatment, *Waste water treatment, Fertilizers, Waste treatment, Anaerobic digestion, Waste disposal, Domestic wastes, Industrial wastes, Pathogenic bacteria, Viruses, Runoff, Odor, Pennsylvania, Injection.
Identifiers: *Land application, Lancaster(Pa).

A Lancaster, Pennsylvania, treatment plant has successfully experimented with the application of raw sludge to farmland. This eliminated a costly step in the treatment process. Because the plant is designed to treat a 9.6 mgd flow and often treats a 12 mgd flow, a means of handling the excess sludge was needed. The system absorbs about 70% sanitary wastes and serves a population of 60,000. The sludge is used on farmland producing field

corn and several grasses eaten by cattle. It cannot be used on land used for crops aimed at human consumption. Although a sludge/acre ratio of 5 tons/acre has been found tolerable, less has been used during experimentation. A Big Wheels application unit was used. It can knife in 600 to 800 gallons per minute of waste material at 6 miles per hour. Critics complain of odor and runoff problems which can be solved by plowing under to the waste material with a disc or plow. Bacterial and viral contamination was also concern. Guidelines have been developed for acceptable amounts of heavy metals. The Big Wheels system eliminates problems associated with compacting soil with tires and sludge runoff during rainy weather. The major drawback is difficulty in injecting sludge into frozen ground. The benefits to the farmer (fertilizer savings of %35 per ton) and the reduction of the load on waste treatment facilities outweigh this disadvantage. (Collins-FIRL)
W77-04707

COMPARISON OF TALC-CELITE AND POLYELECTROLYTE 60 IN VIRUS RECOVERY FROM SEWAGE: DEVELOPMENT OF TECHNIQUE AND EXPERIMENTS WITH POLIOVIRUS (TYPE 1, SABIN)-CONTAMINATED MULTILITRE SAMPLES,
Ottawa Univ. (Ontario). Dept. of Microbiology and Immunology.
S. A. Sattar, and J. C. N. Westwood.
Canadian Journal of Microbiology, Vol. 22, No. 11, p 1620-1627, November, 1976. 1 fig, 6 tab, 29 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Sewerage, *Polyelectrolytes, Viruses, Sewage, Economics.
Identifiers: *Talc-celite, Poliovirus, Virus recovery.

A talc-celite mixture was tested as an economic substitute for polyelectrolyte 60 for virus recovery from sewage. Results indicated that the talc-celite combination minimized disadvantages of using polyelectrolyte 60: expense, varying virus-adsorbing efficiency, and the possibility of requiring hydrolysis to enhance adsorbance of certain viruses. Nearly 49% of poliovirus in 5-liter raw sewage samples was recovered by the mixture. Minimal amounts of high concentrations of infectious viruses remained with this mixture. Performance with the layer technique was consistently better than when the batch technique was used with the 5-liter samples. With 100 millimeter samples, both techniques were comparable. It was concluded that the availability and costs of the talc-celite mixture made it a promising alternative to polyelectrolyte 60. (Collins-FIRL)
W77-04708

COLIPHAGE INTERFERENCE IN THE RECOVERY OF COLIFORM BACTERIA,
Ontario Ministry of Health, Toronto. Environmental Bacteriology.
D. A. Schiemann, J. L. Manley, and M. O. Arnold.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 533-539, March, 1976. 10 tab, 17 ref.

Descriptors: *Fermentation, *Tubes, *Membranes, *Membrane processes, *Filters, *Chlorination, *Waste water treatment, *Coliforms, *Bacteria.
Identifiers: Fermentation tube technique, Membrane filter technique, *Coliphages, Coliform bacteria.

The potential for coliphage interference in the fermentation tube technique with lactose and lauryl tryptose broths on membrane filters with m-Endo medium was examined following contact of coliphage and coliform in a buffer system. Coliphages have a greater resistance to chlorine than coliforms which suggests a higher probability of interference in chlorinated effluent. There is a greater interference after 24 hours than after 48 hours suggesting that there is a reduction of the bacterial inoculum size to a few unadsorbed cells. There is the possibility of multiplication inhibition of previously adsorbed cells but a reversal of phage adsorption and the proceeding of cell division may be caused by the ionic nature of the bacterial growth medium. The key to interference was thought to be adsorption of phage particles to the bacterial cell before introduction into the growth medium. The active metabolization of cells for successful adsorption was suggested by the lack of interference on membranes. It was concluded that coliphage interference in coliform recovery by the fermentation tube method and not with the membrane filter technique is most probable when the ratio of phage:host is increased over those usually found in raw waste water. (Collins-FIRL)
W77-04709

BIOLOGICAL AND PHYSICAL CHARACTERIZATION OF ACTIVATED SLUDGE: A COMPARATIVE EXPERIMENTAL STUDY AT TEN TREATMENT PLANTS,
York Univ. (England). Dept. of Biology.
C. J. Banks, M. Davies, L. Walker, and R. D. Ward.
Water Pollution Control, Vol 75, No 4, p 492-508, 1976. 7 fig, 11 tab, 12 ref.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Activated sludge, *Sludge treatment, *Industrial waste, Bacteria, Biodegradation, Anions, *Waste water treatment, Biological treatment.
Identifiers: *Alcian blue, *Bacterial population studies.

Bacterial population studies; respiration, viability and biochemical operations; as well as the measurement of anionic charges by alcian blue were used to determine the mechanisms of activated sludge adaptation to the environmental constraints of individual treatment works. Bacterial population studies indicated that population differences were more dependent on qualitative differences between sewages than on differences in plant design and operation. Stress favorable to selective bacterial growth was probably due to high concentrations of growth inhibitors of certain bacteria. Stress was not associated with high COD/BOD ratio values, but may have been caused by high loading with a biodegradable industrial waste. The correlation between mean respiration rate and viability suggested that they depended more on plant operation than on sewage quality. Viability was determined by the plant controlled growth rate. The tests on settling characteristics indicated that the solids concentration in returned sludge was fixed by the sludge removal rate from clarifiers and was not limited by the rate of settlement. No correlation between BOD loading rate and settling parameters was found. Concentration dependence was considered the settling parameter most characteristic of the sludge. It was also suggested that concentration dependence of settling rate changes with diurnal variations of sewage composition. Alcian blue has a great affinity for anionic matter and might replace more lossely bound cations which might overestimate the functional anionic charge of flocs. (Collins-FIRL)
W77-04710

VIRUS MOVEMENT IN SOIL COLUMNS FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W77-04712

MEMBRANE FILTER METHOD FOR RECOVERY OF FECAL COLIFORMS IN CHLORINATED SEWAGE EFFLUENTS,
Illinois State Water Survey, Peoria. Water Quality Section.
S. D. Lin.
Applied and Environmental Microbiology, Vol 32, No 4, p 547-552, October, 1976. 2 fig, 5 tab, 13 ref.

Descriptors: *Waste water treatment, Pollutant identification, *Treatment facilities, *Membranes, *Filters, Chlorination, Sewage effluents, Filtration, Coliforms.
Identifiers: *Membrane filter methods, Chlorinated sewage effluents.

Samples of secondary and tertiary effluents of five waste water treatment plants were used to develop a membrane-filter (MF) procedure for fecal coliform (FC) recovery in chlorinated effluents. The one-step M-FC broth-membrane-filter recovery method was not as effective as the multiple-tube, most probable number (MPN), technique. Recovery with the two-step M-FC agar-MF procedure had good agreement with the MPN method. Pre-enrichment, temperature acclimation, and a modified culture medium are useful in improving FC recovery in chlorinated waste water. At 44.5 C, recovery leveled off and actually decreased. A 35C pre-enrichment incubation temperature is recommended for FC recovery by MF techniques. The pre-enrichment incubation period considered best is 4 hours. The study revealed that the two-step MF technique provides higher FC counts than the corresponding MPN bias-corrected values. (Collins-FIRL)
W77-04713

CHARACTERIZATION OF SEPTIC TANK EFFLUENT-A STATISTICAL ANALYSIS,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-04714

EXAMINATION OF SEWAGE SLUDGE WITH SPECIAL REGARD TO PARTICLE SIZE DISTRIBUTION (KLAERSCHLAMMUNTERSUCHUNG UNTER BESONDERER BERUECKSICHTIGUNG DER TEILCHENGROESSENVERTEILUNG),
For primary bibliographic entry see Field 5A.
W77-04716

DETERMINING STABILITY OF SLUDGE FROM AEROBIC DIGESTERS,
Lagnese and Associates, Inc., Pittsburgh, Pa.
K. Marino, and A. Bologna.
Deeds and Data, p D1, D6-7, October, 1976. 2 fig, 1 ref.

Descriptors: *Pollutant identification, *Sludge treatment, *Aerobic treatment, *Stability, *Odor, Analytical techniques, Biochemical oxygen demand, Biodegradation, *Waste water treatment.
Identifiers: Specific oxygen uptake rate, Percent volatile reduction.

Stability and a low odor potential are very important factors in sludge disposal because of the growing use of land application. Some methods and parameters for determining stability in sludge from aerobic digesters are discussed. One parameter used was 'percent volatile reduction,' a carryover from anaerobic digestion. The major problem with this is the amount of biodegradable volatile matter remaining in the sludge. The degree of digestion can be measured by a determination of the specific oxygen uptake rate. Stabilized sludge is indicated by a limited oxygen uptake and a high specific oxygen rate indicates actively digesting sludge. A method was presented for making the determinations. A rate below 1 milligram 02/g vs/hr indicates a stable aerobically digested sludge which can be used for land application. A method which uses visual inspection of anaerobically digesting areas in a laboratory sample was also presented. Another controlled laboratory test to approximate the remaining portion of biodegradable materials was provided. Digested sludges with more than 10% biodegradable solids have proved

objectionable. BOD analysis of the supernatant of the sludge can be helpful. A high BOD concentration indicates sludge instability. Consideration of information on DO, pH, temperature, volatile solids and total solids are also helpful in giving the operator a history of the digestion process. (Collins-FIRL)
W77-04719

HOW TO CONTROL BIOLOGICAL WASTE-TREATMENT PROCESSES,
H. S. Harbold.
Chemical Engineering, Vol 83, No 26, p 157-160, December, 1976. 5 fig, 6 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Treatment facilities, *Water pollution control, Equipment, Industrial wastes, Organic matter.

Much money has been spent for new water pollution control equipment or for upgrading existing treatment plants to meet the requirements of Public Laws 92-500. Because biological waste treatment is now most widely used to remove organic pollutants from industrial wastes, optimizing its control procedures is the object of this discussion. In this category, activated sludge systems are the most versatile and efficient of available processes. Controlling the solids level in biological treatment systems is one of the most important issues. The net production of biological solids is equal to the mass of new biological solids produced by food substrate utilization minus the loss of biological solids by endogenous respiration. Control of the activated sludge process may be accomplished by use of the food-to-microorganism ratio (F/M), the quantity of mixed-liquor suspended solids (MLSS) or mixed-liquor volatile suspended solids (MLVSS), or solids retention time (SRT). The SRT method was proven to be one of the most successful controls of an activated sludge system. With the automation of future treatment plants, this method may be used as the basis for design. (Collins-FIRL)
W77-04722

IS THERE A 'SLUDGE MARKET',
Culp, Wesner, Culp-Clean Water Consultants, Santa Ana, Calif.
For primary bibliographic entry see Field 5E.
W77-04727

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS.
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04730

THE WRE STORM MODEL,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-04737

THE EPA STORMWATER MANAGEMENT MODEL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5B.
W77-04738

DECISION-MAKING FOR WATER QUANTITY AND QUALITY CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney.
In: Short Course Proceedings: Applications of Stormwater Management Models, August 19-23, 1974, Amherst, Massachusetts, University of Massachusetts, Amherst, p 247-249. 4 refs.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Analytical techniques, *Treatment facilities, Mathematical models, Waste treatment, Water quality.
Identifiers: Storm Water Management Model(SWMM).

Results of analyses into alternative procedures for selecting optimal overall storm water control strategy are presented. A linear programming model is used to determine sizes and operating policies for sewer pipes, storage reservoirs, and treatment plants; the Storm Water Management Model (SWMM) generates boundary conditions and provides more detailed information on performance. Because many storm water quality control alternatives serve other functuions, the urban water quality problem seems to fit well into a more general framework of urban water resources management. Traditionally, waste water disposal, water supply, recreation and open space have been considered as separate problems. An 800 acre planned urban development with overall density of four units/acre was able to satisfy the following constraints: water use less than or equal to safe recharge of the aquifer, on-site control of storm water from a 50 yr storm, no structures in the flood-plain, no direct discharge of storm water into on-site recreational lakes, and disposal of treated sewage effluent onto a golf course. About 86% of the total land is in open space. Development costs for the mix of detached houses, townhouses, apartments, and condominiums appear competitive or lower than for existing practices. (See also W77-04730) (Snyder-FIRL)
W77-04739

THREE CASE STUDIES ON THE APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5B.
W77-04742

WATER AND WASTEWATER TREATMENT,
California Univ., Davis. Dept. of Civil Engineering.
E. D. Schroeder.
McGraw-Hill, New York, N.Y. 1977. 370 p. $3.95.

Descriptors: *Water treatment, *Waste water treatment, Dissolved solids, Adsorption, Ion exchange, Membrane processes, Oxidation, Chemical precipitation, Aeration, Surfactants, Mixing, Sedimentation, Coagulation, Flocculation, Centrifugation, Filtration, Biological treatment, Disinfection, Toxicity, Biochemical oxygen demand, Activated sludge, Oxidation lagoons, Aerated lagoons, Aerobic treatment, Nitrification, Trickling filters, Anaerobic digestion, Economics, Model studies, Solids contact processes, Screens.

This textbook for graduate or advanced undergraduate courses on water and effluent treatments uses a modified unit operations/unit processes approach. Two introductory chapters give a general description of reacting systems, reactors, and methods of modeling treatment proccesses, including homo- and heterogeneous reactions. The next 8 chapters deal with specific methods and objectives, viz., physical-chemical removal of dissolved matter (adsorption, ion-exchange, membrane processes, chemical oxidation, precipitation), gas transfer (bubble aeration, surfactant effects, mechanical mixers, film-flow oxygen transfer, gas stripping), solids removal (sedimentation, coagulation, flocculation, centrifugation, filtration), microbiological methods (disinfection, toxicity reduction, BOD reduction, activated sludge treatments, extended aeration, step aeration, biosorption, aerated and oxidation lagoons, aerobic digestion, centrifugal screens, nitrification, and denitrification), trickling filters and other biological film-flow processes, and anaerobic processes (packed beds, ponds). The last (11th) chapter discusses process selection and system synthesis, including economics and experimental studies. Indexes are appended. Study problems and literature references are given after each chapter. (Brown-IPC)
W77-04794

APPLICATION OF WEAK BASE ION-EXCHANGE RESINS FOR REMOVAL OF PROTEINS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
D. H. Foster, R. S. Engelbrecht, and V. L. Snoeyink.
Environmental Science and Technology, Vol. 11, No. 1, p 55-61, January, 1977.

Descriptors: *Proteins, *Waste water treatment, *Ion exchange, *Resins, Organic compounds, Viruses, Activated carbon, Hydrogen ion concentration, Sorption, Water pollution sources, Waste treatment, Water pollution treatment, Separation techniques.
Identifiers: Phenol-formaldehyde resins.

The applicability of resinous sorbents to the treatment of waste streams containing complex organic molecules was determined. Proteins, principally bovine serum albumin, and a bacterial virus, MS2, were used as model materials in conjunction with selected resinous sorbents and activated carbon. Batch studies indicated that phenol-formaldehyde resin showed sorption capacity superior to that of activated carbon. Sorption was pH-dependent, with little removal at extreme pH values, suggesting that Donnan exclusion of the molecules occurred. When protein carboxyl groups were esterified, sorption was significantly reduced, whereas blocking protein amino groups had little effect on sorption except to increase it at low pH values. The influence of pH on sorption was confirmed on continuous flow studies. Waste water organic compounds reduced the capacity of the resin for virus due to competitive effects. Greater than 90% recovery of sorbed protein could be obtained by caustic regeneration. (Witt-IPC)
W77-04802

INVESTIGATIONS ON THE CROSSLINKING OF SPENT SULFITE LIQUOR (UNTERSUCHUNGEN ZUR VERNETZUNG TECHNISCHER SULFITABLAUGE),
Karlsruhe Univ. (West Germany). Polymer Institut.
H. H. Nimz, I. Gurang, and I. Mogharab.
Justus Liebig's Annalen der Chemie, No. 7/8, p 1421-1434, 1976. 7 fig, 31 ref, 6 tab. English summary.

Descriptors: *Sulfite liquor, *Pulp wastes, *Lignins, Wastes, Industrial wastes, Water pollution sources, Ion exchange, Separation techniques, Carbohydrates, *Cation exchange, *Waste water treatment, Waste treatment, Resins, Sulfonates, Byproducts, Oxidation.
Identifiers: Spent sulfite liquor, Crosslinking, *Lignosulfonates.

The crosslinking of lignosulfonates in the form of spent sulfite pulping liquor by oxidative coupling to a cation-exchange resin is reviewed. In addition, the crosslinking of spent sulfite liquor by ten different polyfunctional compounds was investigated. Highest resin yields were obtained with epichlorohydrin and polyethylenimine/tris(chloroethyl)ammonium hydrochloride. In the latter case, an anion-exchange resin is obtained. In model experiments concerning the linkage between carbohydrates and lignin, three dilignols with a benzyle ether bond were obtained from isoeugenol/glycol by oxidative coupling. (Speckhard-IPC)
W77-04807

REDUCTION IN VOLUME OF VISCOSE-ALKALI EFFLUENTS AND THEIR PURIFICA-

TION (UMEN'SHENIE KOLICHESTVA VISKOZNO-SHCHELOCHNYKH STOKOV I IKH OCHISTKA),
S. N. Klinova, A. B. Pakshver, and G. M. Vinogradova.
Khimicheskie Volokna, No. 3, p 33-36, 1976. 2 fig, 3 ref, 4 tab.

Descriptors: *Water conservation, *Water pollution control, *Cellulose, Textiles, Water pollution sources, Wastes, Industrial wastes, Alkalis(Bases), Hydrogen sulfide, Chemical oxygen demand, Dialysis, *Recycling, *Water reuse, Chemical precipitation, *Filtration, Enzymes, Effluents, Carbohydrates.
Identifiers: *Viscose rayon, Carbon disulfide, Hemicellulose, Polysaccharides.

Large amounts of alkaline viscose factory effluents are formed during the washing of filter presses, filter cloths, and pans of filter frames. Other additions of alkali come from dialysis and mercerization. These effluents contain 0.3-5.5 g/liter of cellulose, 0.16-3.2 g/liter of NaOH, 0.65-990 mg/liter of carbon disulfide, and 7-200 mg/liter of hydrogen sulfide. These effluents have a high COD which is augmented by the presence of reducing agents (Hemicellulose, hydrogen sulfide). Studies showed that water consumption and effluent quantities could be reduced by eliminating the dialytic purification of squeezed-out spent alkali during cellulose mercerization and the use of deposited layers (filter cakes) for first-stage viscose filtration. It is also possible to recycle effluents for dissolving viscose. Remaining effluents can be acidified in order to precipitate most of the dissolved cellulose. The polysaccharides in the filtrate containing gamma-cellulose and hemi-celluloses can be saccharified by the addition of cellulolytic enzymes. (Chern-IPC)
W77-04808

REDUCTION OF SUSPENDED SOLIDS IN WOODROOM EFFLUENTS (REDUKSJON AV SUSPENDERT MATERIALE I AVLOPSVANN FRA TOMMERRENSERIER),
Norwegian Pulp and Paper Research Inst., Oslo.
M. Damhaug.
Norsk Skogindustri, Vol. 30, No. 12, p 368-370, 374, December, 1976. 4 fig, 6 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Suspended solids, *Flotation, *Sedimentation, Pulp and paper industry, Effluents, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Europe, Foreign research, Air, Coagulation, Bark, Wood wastes, Laboratory tests, Pilot plants, Water pollution control, Sands.
Identifiers: Norway, Woodrooms(Paper mill).

Woodroom effluents containing bark particles, slivers, and sand represent a major pollution source. Since wet barking operation in pulp mills contribute significantly to the total solids losses of the mill, research on possible decreases of these discharges has been conducted at the Norwegian Pulp and Paper Research Institute. Some results of preliminary laboratory and pilot-plant studies are cited to indicate promising approaches via dissolved-air flotators and sedimentation equipment with and without use of coagulants. (Brown-IPC)
W77-04810

INFLUENCE OF RETENTION ON THE TREATMENT OF EFFLUENTS (INFLUENCE DE LA RETENTION SUR LE TRAITEMENT DES EFFLUENTS),
P. Lejeune, and P. Leydier.
La Papeterie, Vol. 98, No. 10, p 478, October, 1976. 1 fig, 1 ref.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Suspended solids, Colloids, Foreign countries, Pulp and paper industry, Effluents, Waste treatment, Europe, *Retention.
Identifiers: *Retention aids(Papermaking), France, Paper machines.

The use of solids-retention aids on the paper machine in a French paper mill (Papeteries de la Ferrandiniere Leydier and Company at St. Vallier), had favorable effects on the effluent treatment operation-reduced suspended solids and colloidal meterials in the effluent. (Speckhard-IPC)
W77-04811

WATER AND PAPER (L'EAU ET LE PAPIER),
H. Giroud.
La Papeterie, Vol. 98, No. 10, p 476-477, October, 1976. 2 illus, 1 tab.

Descriptors: *Water conservation, *Waste water treatment, Pulp and paper industry, *Pulp wastes, Wastes, Water pollution sources, Industrial wastes, Water pollution treatment, *Costs, Flocculation, Flotation, Chemical oxygen demand, Biochemical oxygen demand, Treatment facilities, Europe.
Identifiers: Box plants, Printing presses, Corrugators, Wash water, Waste paper, Fiber recovery, Packaging papers, Flexography.

The important of reducing water consumption in papermaking is briefly discussed, especially as a means of reducing effluent treatment costs. Two examples of low-cost effluent treatment are outlined: flocculation-flotation equipment in a mill manufacturing packaging paper from waste papers, and equipment for treating flexographic press and corrugator was water in a box plant. In the case of the packaging paper mill, the effluent treatment has resulted in the recovery of 800 kg of fiber/day, and reduced effluent COD by mre than 60% and effluent BOD by more than 40%. (Speckhard-IPC)
W77-04812

CENTRIFUGES FOR THE TREATMENT OF PAPERMAKING EFFLUENTS (LES CENTRIFUGEUSES APPLICABLES AU TRAITEMENT DES EAUX RESIDUAIRES DE PAPETERIE),
La Papeterie, Vol. 98, No. 10, p 482-483, October, 1976. 3 fig, 1 tab.

Descriptors: *Centrifugation, *Sludge treatment, *Pulp wastes, Pulp and paper industry, Sludge, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Effluents, *Performance, *Dewatering, Solid wastes, Flocculation, Waste water treatment.
Identifiers: *Centrifuges(Treatment).

Data are presented to show the performance of Super-D-Canter solid-bow centrifuges in dewatering various papermaking sludgges. The level of solids removal is plotted as a function of the dryness of the extracted sediment for various sludges. The use of a flocculant is shown to increase the level of solids removal. (Speckhard-IPC)
W77-04813

EXPERIENCES WITH THE THICKENING AND BURNING OF BIOLOGICAL AND NON-BIOLOGICAL SLUDGES (ERFAHRUNGEN BEI DER ENTWAESSERUNG UND VERBRENNUNG VON BIOLOGISCHEN UND NICHT-BIOLOGISCHEN SCHLAEMMEN),
Cellulose Attisholz A. G. (Switzerland).
For primary bibliographic entry see Field 5E.
W77-04814

OPPORTUNITIES AND RISKS OF CLOSING THE WATER CYCLE IN PAPER MILLS (CHANCEN UND RISIKEN DER WASSER-KREISLAUFSCHLIESSUNG IN PAPIER-FABRIKEN),
Technische Universitaet, Darmstadt (West Germany). Institut fuer Paperfabrikation.
L. Gottsching, and H-L. Dalpke.
Das Papier, Vol 30, No 10A, p V128-V138, October, 1976. 12 fig, 8 ref.

Descriptors: *Pulp and paper industry, *Water reuse, Water quality, Industrial water, Water conservation, Water pollution control, Microbiology, Inorganic compounds, Salts, Organic compounds, Solutes, Pollution abatement, *Recycling, Waste water treatment.
Identifiers: *Closed systems, Tissue paper mills.

The fundamental principles of paper-mill closed water systems are described, based on the work of Brecht and coworkers. New investigations, both in the laboratory and in the mill, are considered, and the effects on paper quality and microbiological growth resulting from the higher concentrations of inorganic salts and or organic solutes are discussed. The water condition and product quality are reported for a tissue mill which has been operating with a closed circuit for a long time, with an average discharge of 1 cu m of water per ton of product. (Ward-IPC)
W77-04815

SULFITE VERSUS KRAFT FROM THE POINT OF VIEW OF ENVIRONMENTAL PROTECTION (SULFIT VERSUS SULFAT AUS DER SICHT DES UMWELTSCHUTZES),
VIBCONSULT A. G., Zollikon (Switzerland).
H. Rahm.
Das Papier, Vol 30, No 10A, p V24-V33, October, 1976. 10 fig, 18 ref.

Descriptors: *Water pollution control, Pulp and paper industry, Water conservation, Wastes, Industrial wastes, Water pollution sources, Air pollution, *Water reuse, *Recycling, Bleaching wastes, Chlorine, Chlorides, Gases, Odor, Evaporation, Effluents, *Pulp wastes.
Identifiers: *Sulfite pulp mills, *Kraft mills, Closed systems, Chemical recovery.

The closing of the water cycle in unbleached sulfite and kraft mills is discussed first. For sulfite processes (calcium, magnesium, ammonium, or sodium base), the recovery and recycling of the base and of sulfur dioxide are stressed. The removal of malodorous gases from the kraft process is described. The possibilities for cleaning up the evaporator condensates in both processes are shown. Descriptions are given of processes for including the bleach plant effluents in the overall pulp mill liquor cycle and for removing chlorides from the system. The possibility of almost complete replacement of chlorine in sulfite pulp bleaching is explained, and the basic principles are outlined which are to govern the closing of the water cycle, in late 1976, of the Great Lakes Paper Company kraft mill in Ontario (Canada). (Ward-IPC)
W77-04816

CONTINUOUS SOLID-BOWL CENTRIFUGES FOR CLARIFICATION AND DEWATERING OF SLUDGES IN THE PAPER INDUSTRY (CENTRIFUGEUSES CONTINUES A BOL PLEIN POUR CLARIFICATION ET DESHYDRATATION DES BOUES DANS L'INDUSTRIE PAPETIERE).
Papier, Carton et Cellulose, Vol 25, No 10, p 68-70, October, 1976. 2 fig, 3 illus.

Descriptors: *Sludge treatment, *Centrifugation, Equipment, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, *Dewatering, Design, Performance, Solid wastes, Sludge, Pulp and paper industry, Waste water treatment.
Identifiers: *Centrifuges(Treatment).

A brief description is presented of the design and performance characteristics of Klockner-Humboldt-Deutz cocurrent continuous solid-bowl centrifuges for the dewatering of papermaking effluent sludges. (Speckhard-IPC)
W77-04817

WASTEWATER PROBLEMS AND ECONOMY (ABWASSERPROBLEME UND WIRTSCHAFTLICHKEIT),
Rondo Ganahl A.G. (Austria).
K. Dickbauer.
Papier- und Kunststoff-Verarbeiter, Vol 11, No 11, p 55-56, 58, November, 1976. 3 illus.

Descriptors: *Water reuse, *Water conservation, *Pulp and paper industry, Wastes, Effluents, Industrial wastes, Water pollution sources, Water pollution control, Industrial water, Cooling water, *Recycling, Oil, Lubricants, Biological treatment, Waste water treatment, Economics, Carbohydrates.
Identifiers: *Corrugated board, Starch.

This examination of effluent problems in the corrugated board industry points out the advantages of waste water recycling. In the case of cooling water, a substantial reduction in the fresh water consumption results. With starch-containing effluent, the most important aspect of recycling is a saving of 2-4% in starch consumption. Oil-containing waste water can be greatly reduced by conversion to an oil lubricating system operating via compressed air. Lubricating oil consumption is also reduced by 80-90%. Finally, recycling can eliminate the need for building and operating a biological clarifier. (Speckhard-IPC)
W77-04818

SORPTION OF ORGANIC IMPURITIES FROM TEXTILE INDUSTRY EFFLUENTS ON ION-EXCHANGERS (SORPCJA ZANIECZYSZCZEN ORGANICZNYCH ZE SCIEKOW PRZEMYSLU WLOKIENNICZEGO NA JONITACH),
Centralne Laboratorium Dziewiarstwa (Poland).
J. Rouba.
Przeglad Wlokienniczy, Vol 30, No 10, p 499-501, October, 1976. 4 fig, 5 ref, 2 tab.

Descriptors: *Textiles, *Waste water treatment, *Ion exchange, *Organic compounds, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Effluents, *Sorption, Cellulose, Chemical oxygen demand, Hydrogen ion concentration, Solvents, Costs, Separation techniques, Tertiary treatment, Water quality control, Waste treatment.
Identifiers: Regenerated cellulose, Synthetic fibers, Ethyl alcohol, Chemical recovery.

A study of the sorption of organic impurities and the process of ion-exchanger regeneration was conducted, using Wofatit EA-60 (a styrene-divinylbenzene copolymer containing trimethylammonium groups) and the overall effluent from a textile plant processing regenerated cellulose and synthetic fibers (color 94 mg Pt/cu dm, oxidizability 100 mg oxygen/cu dm, COD 400 mg oxygen/cu dm, pH 9.4). Satisfactory reductions of color and COD were obtained with two sorption columns. A factor limiting the use of ion-exchangers in industrial practice is the costly and time-consuming regeneration process. The use of organic solvents (e.g., ethanol containing 4% HCl) instead of alkaline NaCl solution can lower the cost and shorten the time of regeneration, making the use of ion-exchangers more economical than activated carbon filters. (Stapinski-IPC)
W77-04819

USE OF OXYGEN FOR PURIFICATION OF PULPING EFFLUENTS BY THE ACTIVATED SLUDGE METHOD (ZASTOSOWANIE TLENU DO OCZYSZCZANIA SCIEKOW POCELULOZOWYCH METODA OSADU CZYNNEGO),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
J. Sikora, and J. Zielinski.
Przeglad Papierniczy, Vol 32, No 10, p 382-384, October, 1976. 14 ref, 2 tab.

Descriptors: *Waste water treatment, *Aeration, *Oxygen, *Pulp wastes, *Activated sludge, Wastes, *Oxygenation, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Air, Biochemical oxygen demand, Chemical oxygen demand, Lignins, Hydrogen ion concentration, Carbon dioxide, Economics, Effluents, Pulp and paper industry, Sulfite liquors.
Identifiers: *Spent sulfite liquors, Sulfite pulp mills.

A comparative study was made of the degree of purification of spent sulfite liquor obtained by the activated sludge process with the use of air vs. oxygen in the aeration chamber. The experiments were carried out in a laboratory model of the purification system. The oxygen was of 83-85% purity. The retention time was 6 hr in the system with air and 2 hr with oxygen. Despite the shorter aeration time, the reduction of 5-day BOD and COD was 90-92% and 45-48%, respectively, as compared with 76-81% and 34-35% in the conventional system. The amount of lignosulfonic acids eliminated was also higher (16-19% as compared with 7-8% when air was used). An additional advantage of the use of oxygen was a smaller amount of excess activated sludge. The oxygen consumption was about 0.75 g/g 5-day BOD for air and 1.35 g/g 5-day BOD for oxygen. with oxygen the pH of the effluent had to be adjusted to a higher level (6.8-7.1 bs. 6.8-6.9) to neutralize the excess carbon dioxide formed. From an economic veiwpoint, the costs or producing oxygen must be weighed against savings achieved by the reduction of the capacity of the aeration chambers and lower power consumption for aeration. The increasing use of oxygen as a chlorine replacement for pulp bleaching enhances the possibility of its additional use for effluent purification. (Stapinski-IPC)
W77-04820

PURIFICATION OF EFFLUENTS FROM BARKING BEECH AND PINE (BADANIA NAD OCZYSZCZANIEM SCIEKOW Z KOROWALNI DREWNA BUKOWEGO I SOSNOWEGO),
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Chemistry.
S. Kaminski, and M. Jankowska.
Przeglad Papierniczy, Vol 32, No 10, p 358-363, October, 1976. 3 fig, 16 ref, 8 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Coagulation, *Sedimentation, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Water quality control, Bark, Pine trees, Biological treatment, Suspended solids, Lime, Silica, Chemical oxygen demand, Hydrogen ion concentration, Neutralization, Temperature, Pulp and paper industry, Effluent, Foreign countries, Europe.
Identifiers: Beech trees(Fagus), Aluminum sulfate, Poland, Kraft mills.

The Swiecie mill in Poland produces kraft pulp from pine and beech woods, the daily consumption being 500 and 160 tons, respectively. Barking of the beech and of a part of the pine by the wet process requires daily consumptions of fresh water of about 8,000 cu m. The barking effluents are purified mechanically in Dorr sedimentation tanks, then subjected to biological purification. The suspended solids content after sedimentation is 10-704 mg/liter and frequently exceeds the maximum permissible level of 80 mg/liter. In an attempt to improve the clarification of the effluents, experiments were conducted in which coagulants (lime and aluminum sulfate) and flocculants (activated silica and a polyacrylamide preparation) were added to the raw effluents prior to sedimentation. The effects of the additives were evaluated determinations of COD, suspended solids, and light transmission. The effluent samples studied had a COD ranging from 1733 to 3562 mg oxygen/liter and a suspended solids content ranging from 774 to 2418 mg/liter. The highest degree of clarification was obtained with lime and with aluminum sulfate. Lime, however, had the inconvenience of increasing the pH, thus requiring a second neutalization prior to biological purification. Flocculants alone had little effect, but the addition of polyacrylamide the the effluent containing aluminum sulfate had a favorable effect on the rate of sedimentation. Temperature had no significant effect on the clarification process. (Stapinski-IPC)
W77-04821

MODIFIED WATER EXTRACTOR RECOVERS BARK FINES, REDUCES CLARIFIER UPSETS.
Pulp and Paper, Vol 50, No 11, p 139, October, 1976. 1 fig, 1 illus.

Descriptors: *Bark, *Dewatering, *Waste water treatment, *Pulp wastes, Suspended solids, Wood wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Pulp and paper industry, Effluents, Water pollution control, Equipment.
Identifiers: Clarifiers, Woodrooms(Paper mill).

A Voith-Morden (formerly Baker) water extractor which was originally developed for concentrating paper stock is being used to dewater bark fines from pulp mill woodrooms. Efficiencies of 45-50% are normally achieved while raising fines consistencies from 0.6-0.7% up to 12-14%. Flow rates through a triple-tube water extractor vary from 2400 to 3000 gal/min with effluent clarity at 1000 to 2000 ppm. (Witt-IPC)
W77-04823

PERCOLATING EFFLUENT INTO GROUND REDUCES COLOR AT MISSOULA MILL,
Hoerner Waldorf Corp., Missoula, Mont.
M. Olson, D. Luoma, A. T. Wallace, and G. Grimestad.
Pulp and Paper, Vol 50, No 11, p 142-144, October, 1976. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Infiltration, *Color, Aerated lagoons, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Economics, Operating costs, Capital costs, Costs, Aeration, Pulp and paper industry, Effluents, *Percolation, Soil water movement, Evaporation, Treatment facilities, Montana.
Identifiers: Clark Fork River(Montana), Kraft mills.

The Hoerner Waldorf Corporation mill in Missoula, Montana, produces about 1150 tons/day of predominantly unbleached kraft pulp. The 16,000,000 gallons/day of waste water undergoes clarification, secondary treatment through aeration, and is sent to a series of lagoons of various sizes and depths. some of the liquid is lost from the lagoons by evaporation; however, the largest outflow is percolated away through the pond bottoms (rapid infiltration). Liquid not removed by these two mechanisms is discharged into the Clark Fork River. Approximately 45% of the mill waste water is being treated through a rapid infiltration system requiring a capital cost of about $250,000 (or $4.,000/acre). Operating costs have averaged well under $0.10/ton of production. At present infiltration rates, approximately 120 acres would be required to dispose of the total mill effluent. Economics are very favorable compared to capital cost of $4,000,000-8,000,000 and operating costs from $0.50 to $3.00/ton for other color removal alternatives. (Witt-IPC)
W77-04824

BOISE MEASURES SLUDGE ULTRASONICALLY,
Boise Cascade Corp., St. Helens, Oreg.
J. A. Falkowski.
Pulp and Paper, Vol 50, No 11, p 107, October, 1976. 2 fig.

Descriptors: *Instrumentation, *Aerated lagoons, *Sludge, Depth, *Ultrasonics, Industrial wastes, Wastes, Water pollution sources, Solid wastes,

Oregon, Pulp and paper industry, Pulp wastes, Sewage treatment, Aeration, Biochemical oxygen demand, Effluents, Electronic equipment, Measurement, *Pollutant identification.
Identifiers: St. Helens(Oregon), Kraft mills.

The bleached kraft pulp and paper mill of Boise Cascade Corporation at St. Helens, Oregon, uses an electronic digital depth finder to measure the sludge depth in a 40-acre aeration basin, in which the mill's effluent undergoes primary treatment before being discharged to a joint municipal-industrial facility operated by the city of St. Helens. The basin is equipped with ten 125-hp surface aerators to treat 32 million gal/day of waste waters having an inlet BOD loading of 55,000 lb/day. (Witt-IPC)
W77-04825

NSSC RECOVERY PROCESS ELIMINATES FIVE-DAY BOD 5 LOAD AND RECOVERS CHEMICALS,
Sonoc Products Co., Hartsville, S. C.
W. R. Cook, and J. R. Parkinson.
Pulp and Paper International, Vol 18, No 11, p 45-47, October, 1976. 1 fig, 2 illus.

Descriptors: *Pulp and paper industry, *Water pollution control, Wastes, Industrial wastes, Water pollution sources, South Carolina, Southeast U.S., Biochemical oxygen demand, Pulp wastes, Sulfite liquors, Waste water treatment.
Identifiers: *Chemical recovery, *NSSC(Neutral sulfite semichemical) pulp mills, Sodium sulfite, Aluminum oxide, Sulfite mills(Pulp).

The sulfite recovery process first used by Sonoco Products Company for its neutral sulfite semichemical mill in Hartsville, South Carolina, has now been licensed by two other paper producers. The process, which combines spent liquor sodium with alumina to give a nonsmelting combustion reaction, has not only eliminated the BOD load which went to a nearby waterway, but has also provided most of the sodium sulfite requirement for the NSSC pulp mill. A brief description of the process is given and a flow diagram is included. (Witt-IPC)
W77-04826

RECYCLING SEWAGE WASTE RESOURCES AND SOIL AMELIORATION,
Forest Service (USDA), Washington, D. C.
For primary bibliographic entry see Field 5E.
W77-04827

ENVIRONMENTAL CONCERNS OF WOOD-PROCESSING INDUSTRIES (IN AUSTRIA),
Bundeskammer der Gewerblichen Wirtschaft, Vienna (Austria).
For primary bibliographic entry see Field 5G.
W77-04829

MILL VISIT TO HAINDL PAPIER GMBH AT SCHONGAU (BESICHTIGUNG DES WERKES SCHONGAU DER HAINDL PAPIER GMBH).
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 21, p 808-809, November 15, 1976. 1 illus, 2 tab.

Descriptors: *Water treatment, *Waste water treatment, *Pulp wastes, *Treatment facilities, Pulp and paper industry, Effluents, Wastes, Water pollution sources, Industrial wastes, Water pollution treatment, Filtration, Coagulation, Water reuse, *Recycling, Sludge treatment, Dewatering, Water pollution control, Europe, Foreign countries.
Identifiers: White water(Paper machines), Germany, Newsprint mills.

The operations and equipment of the Schongau (Germany) mill of Haindl Papier GmbH. are described. This mill produces 315,000 tons of newsprint annually from internally produced groundwood and refiner pulp as well as from waste paper and semibleached softwood kraft pulp on four Voith paper machines. Freshwater supplies come from surface waters which have been cleaned in gravel filters (700 cu m/hr). Discharged paper-machine white waters are treated in 4 scraper filters, and the effluent is purified chemically-mechanically in a Passavant coagulator and partly recycled. The sludge deposits are dewatered in two Andritz belt presses and trucked to landfills. (Ward-IPC)
W77-04830

LIQUID-SOLIDS SEPARATION USING AN INCLINED PLATE CLARIFIER,
R. Verstraete.
Canadian Pulp and Paper Industry, Vol. 29, No. 11, p 38-40, November, 1976. 4 fig, 1 illus, 1 tab.

Descriptors: *Waste water treatment, *Separation techniques, Equipment, Operation and maintenance, *Pulp wastes, Waste treatment, Bark, Wood wastes, Water pollution sources, Water pollution treatment, Industrial wastes, Treatment facilities, Costs, Suspended solids.
Identifiers: *Clarifiers, Woodrooms(Paper mill).

The inclined-plate clarifier is claimed to be a more efficient alternative to conventional clarifiers at one-half the cost. A description is given of the unit's principle of operation, sizing parameters, methods of sizing, applications (e.g., bark removal from woodroom effluent), and advantages. (Witt-IPC)
W77-04832

FEDERAL AND STATE WASTE TREATMENT REGULATIONS AFFECTING SEAFOOD PROCESSORS IN GEORGIA,
Georgia Univ., Athens. Marine Extension Service.
For primary bibliographic entry see Field 6E.
W77-04840

RECLAMATION OF WATER FROM WASTES IN SOUTHERN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.
Bulletin No. 80-5, November 1975. 40 p.

Descriptors: *California, *Water reuse, Reclamation, *Water conservation, *Reclaimed water, Projections, Planning, Decision making, Waste water treatment, Costs, Social aspects, Legal aspects.
Identifiers: Southern California.

An overview of the potentialities of waste water reclamation in southern California is presented. Historical production, treatment, and reclamation practices, reclamation potential, and factors to be considered in evaluating reclamation projects are examined. It was found that: a) the amount of waste water coming into treatment plants of 1.0 mgd or larger increased 1,197,000 acre-feet in water year 1967-68 to 1,386,000 acre-feet annually in 1972-73, b) concentrations of total dissolved solids ranged from 200 to 3520 mg/l with 29% of the waste water having less of a concentration than that of Colorado River water, c) 1,148,000 acre-feet of the total 1,386,000 acre-feet of waste water treated annually was discharged into the ocean after treatment, d) though 80,000 acre-feet of waste water was reclaimed in 1972-73, the increase between 1967-68 and 1972-73 was only 22,000 acre-feet, e) projections indicate that the area could reclaim a total of 850,000 acre-feet by the year 2000, and f) thirty-eight specific reclamation opportunities which would provide 400,000 acre-feet of water have been identified. It is concluded that while the reclamation potential is large, this potential will not be reached unl
W77-04850

GETTING MORE FROM A LIMITED NATURAL RESOURCE.
For primary bibliographic entry see Field 6E.
W77-04911

EFFLUENT GUIDELINES AND STANDARDS: PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-04925

PROTECTION OF THE ENVIRONMENT: PAINT FORMULATING POINT SOURCE CATEGORY: PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-04926

EFFLUENT GUIDELINES AND STANDARDS: PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-04928

BRINE DESALINATION PROCESS WITH PHASE-BREAKING BY COLD HYDROCARBON INJECTION,
Texaco Inc., New York. (Assignee).
For primary bibliographic entry see Field 3A.
W77-04951

PROCESS FOR REMOVING DISSOLVED PHOSPHORUS FROM WATER MAGNETICALLY,
Massachusetts Inst. of Tech. Cambridge. (Assignee).
C. de Latour.
U.S. Patent No. 3,983,033, 7 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 950, No 4, p 1549, September 28, 1976.

Descriptors: *Patents, *Water quality control, *Water purification, *Waste water treatment, Sewage treatment, Separation techniques, *Phosphorus, Iron oxides, Cations, Electrolytes, Coagulation.
Identifiers: Seed material, *Magnetic removal(Wastes).

A process is provided which permits huge quantities of solution of the order of thousands of gallons per hour to be cleansed of dissolved phosphate ions. Seed materials are employed that are available in sufficient quantites and at a sufficiently low cost to permit their use in the necessary volume to make the process useful. The process includes introducing iron oxide seed material to the solution and introducing to the solution the electrolyte cation species A1+3. The electrolyte cation acts to associated the dissolved phosphorus with the iron oxide seed material to form a coagulum. The coagulum is then magnetically separated from the aqueous solution. Where little or no solid materials are naturally present in the solution, there is added a clay material to provide more surface for phosphate adsorption and to enhance formation of the coagulum. The serial or concurrent steps of adding ion oxide and clay, and then the electrolyte cation, the agitation of the solution after each addition, and allowing suitable retention times, before magnetic removal, result in most effective phosphate removal. Separation of the coagulum from the aqueous solution if effected by passing the solution through a magnetic filter and allowing filter contact time for coagulum removal substantially less than the retention time necessary for coagulum formation. (Sinha-OEIS)
W77-04952

WET COMBUSTION OF ORGANICS,
Dow Chemical Co., Midland, Mich. (Assignee).
R. W. Diesen, and J. R. Moyer.
U.S. Patent No. 3,984,311, 4 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 256, October 5, 1976.

Descriptors: *Patents, *Organic wastes, *Waste water treatment, *Water pollution treatment, Organic compounds, Oxidation, Chemical reactions, Catalysts.
Identifiers: *Wet combustion.

Disposal of aqueous wastes containing relatively high concentrations of organic compounds presents a difficult pollution problem. The invention is an anionic cocatalyst system which permits the oxidation of substantially all organic and many inorganic compounds in an aqueous solution which may contain brines by use of an oxidizing agent, such as air, at moderate temperature and pressure. An aqueous solution of the compounds to be oxidized is acidified to a pH of less than about 4 and to the acidified solution in comination are added a nitrate ion source and at least one of either a bromide or an iodide ion source. Additon of a small stoichiometric excess of oxygen relative to that required to oxidize all of the organ to CO2 and H2O and heating to the vicinity of about 150 degrees -300C. for an appropriate time period effect the oxidation. (Sinha-OEIS)
W77-04957

PROCESS FOR INSOLUBILIZING POTENTIALLY WATER POLLUTABLE WASTES FROM SODIUM OR AMMONIUM TYPE SULFUR DIOXIDE AIR POLLUTION CONTROL SYSTEMS,
Industrial Resources, Inc., Chicago, Ill. (Assignee).
J. M. Dulin, E. C. Rosar, J. M. Genco, and H. S. Rosenberg.
U.S. Patent No. 3,984,312, 14 p, 5 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 256, October 5, 1976.

Descriptors: *Patents, *Water pollution treatment, Water pollution control, Sulfur compounds, Inorganic compounds, Chemical reactions, Industrial wastes, Waste disposal, *Waste treatment.
Identifiers: Air pollution control systems.

Wastes are insolubilized from air pollution control processes which employ sodium or ammonium-containing compounds to react with SO2 in flue gases to clean up the flue or stack gases. After reacting with the SO2, the resultant sodium or ammonium sulfate/sulfite compounds are water soluble and pose a water pollution problem in their disposal. In this process soium or ammonium sulfate containing solutions, derived from wet scrubber wastes or dissolved baghouse filter cakes are reacted abiotically or biotically in a single or multi-stage reaction with ferric sulfate solutions, derived in turn from an iron-containing source and a sulfuric acid-containing liquid at a temperature of between about 50 degrees -300F. at an acid pH to produce sodium or ammonium hydroxy ferric sulfate or sulfite products, which may be anhydrous or hydrated. These end products are generally crystalline, water insoluble and may be easily dewatered or dried, and thereafter landfilled without posing severe water pollution problems. The process also provides for disposal of polluted hot waste water from industrial or power plant processes, waste sulfuric acid, low grade waste iron scrap, steel furnace dust, ferrous wastes from local municipal incinerators, steel manufacturing pickle liquors, pyrite or gob dump leach waters, acid mine waters and the like. (Sinha-OEIS)
W77-04958

PREFERENTIAL REMOVAL OF AMMONIA AND PHOSPHATES,
Chemical Separations Corp., Oak Ridge, Tenn. (Assignee).
I. R. Higgins.
U.S. Patent No. 3,984,313, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 257, October 5, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, *Ammonia, *Phosphates, *Ion exchange, Separation techniques, Cation exchange.
Identifiers: Resin regeneration.

There are instances where solutions contain many additives only several of which are objectionable but which cannot be removed by ion exchange because of the expense of rejuvenating the ion exchange resin, for example the tertiary treatment of sewage. Sewage water containing many pollutants including ammonia and phosphates is treated so that the ammonia and phosphates are preferentially removed through ion exchange while the other contaminants are allowed to remain in the water. Ferric hydroxide is deposited within the matrix of strong acid type cation exchange resin and the resin is rejuvenated with sodium hydroxide. (Sina-OEIS)
W77-04959

PROCESS FOR SELECTIVE REMOVAL AND RECOVERY OF CYANIDE VALUES BY ION EXCHANGE,
Rohm and Haas Co., Philadelphia, Pa. (Assignee).
W. Fries.
U.S. Patent No. 3,984,314, 4 p, 10 ref; Official Gazette of the United States Patent Office, Vol 951, no 1, p 257, October 5, 1976.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution control *Water pollution treatment, *Ion exchange, Anion exchange, Resins.
Identifiers: *Cyanide, Resin regeneration, *Cyanide ion recovery.

By pre-treatment of the cyanide ion, even in the presence of other salts and organic moieties which form a material that interferes with ordinary cyanide adsorption on an ion exchange resin, cycanide can be efficiently removed from industrial effluents. The remval process involves the addition of certain transition metal ions, initially in excess of a stoichiometric amount, to the cyanide containing stream. The pH of the combined solution is maintained within the prescribed range of 7 or greater, which is necessary to form the metallocyanide anionic complex, by the addition of an alkalzing agent such as free NH3. This complex is conveniently adsorbed on an anion exchange resin. This is optionally followed by contacting the treated stream with a cationic exchange resin to remove any remaining excess of the transition metal, which would otherwise form a substitute pollutant in the effluent. Through the judicious selection of the polymeric adsorbents, both being ion exchange resins, and through the utilization of a special regeneration system, it has been determined that most of the adsorbed cyanide and transition metal can be desorbed as a concentrated solution, permitting ultimate disposal or reuse of the cyanide ion. (Sinha-OEIS)
W77-04960

TREATING FOUL REFINERY WASTE WATERS WITH ABSORBER GAS,
Ashland Oil, Inc., Ky. (Assignee).
G. I. Worrall, D. A. Strege, and G. D. Myers.
U.S. Patent No. 3,984,316, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 951, no 1, p 257, October 5, 1976.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution control, *Water pollution treatment, Hydrogen sulfide, Ammonia, Mixing, Gases, Organic compounds.
Identifiers: Refinery waste water, *Absorber gases.

The objects of this invention are to povide a method of removing hydrogen sulfide and ammonia from refinery waste waters so that the steam consumed is minimized and the ultimate recovery of hydrogen sulfide as a liquid sulfure product rather than allowing it to be discharge into the air in the form of sulfur dioxide. The refinery waste waters will be non-pollution when released to natural waterways. The process for removing dissolved hydrogensulfide and ammonia consists of: a stream of a refinery absorber gas (derived from catalytic cracking, crude oil topping, reforming or hydrotreating and comprising a gas selected from the group consisting of methane, ethane, ethylene, propylene, hydrogen, nitrogen, carbon dioxide, and mixtures of two or more of them) is introduced into one end of a contacting zone; a stream of the refinery waste water is introduced into the other end of the zone; the two streams are flowed countercurrently through the contacting zone and intimately mixed; an effluent stream of absorber gas is removed from one end of the zone, this gas stream being enriched with hydrogen sulfide gas and containing only neglibel quantitites of ammonia; and simultaneously a waste water stream containing most of the original ammonia present but only neglible quantities of hydroen sulfide is removed from the other end of the zone. The final step is to remove the dissolved ammonia from the effluent waste water stream. (Sinha-OEIS)
W77-04961

APPARATUS AND PROCESS FOR CONTINUOUS CONCENTRATION AND WASHING OF SOLIDS FROM A SOLIDS-CONTAINING FLUID,
Artisan Industries Inc., Waltham, Mass. (Assignee).
J. Donovan.
U.S. Patent No. 3,984,317, 15 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 951, no 1, p 258, October 5, 1976.

Descriptors: *Patents, Industrial wastes, *Filtration, *Separation techniques, *Solid wastes, Suspended solids, Waste disposal, *Water pollution treatment, Water pollution sources, *Waste treatment.
Identifiers: *Washing(Wastes).

The apparatus and process of the invention sparates solids from a solids-containing fluid and then 'washes' the solids by use of one or more processes. A concentrator-washer has separate concentrating and washing chambers within a unitary housing. An inlet is provided in the housing for the introduction of a pressurized solids-containing fluid and, downstream of the washing chamber, an outlet is provided in the housing for the discharge of a concentrated slurry of washed solids. In both the concentating chamber and the washing chamber, at least one stationary or rotating filter element is provided in each chamber, each of the filter elements having at least one filtering surface and a suitable drainage system for the removal of the filtrate. (Sinha-OEIS)
W77-04962

MEMBRANE SEPARATION EQUIPMENT,
Dorr-Oliver Inc., Stamford, Conn. (Assignee).
For primary bibliographic entry see Field 3A.
W77-04963

SEWAGE TREATMENT PLANT,
J. R. Kaelin.
U.S. Patent No. 3,984,321, 6 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 951, no 1, p 259, October 5, 1976.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Treatment facilities, Water pollution treatment, Biological treatment.

An improved compact biological seepage treatment plant is comprised of a series of serially connected treatment tanks of arcuate shape when viewed in top plan veiw. They are joined operatively together essentially in an end-to-end circumferential ring-like manner, forming a central space adapted to house additional sludge dehydrating and auxiliary treatment apparatus and equipment for control and maintainance of the plant. A particular advantageous feature includes providing additional concentrically placed series of treatment tanks all connected to provide for selectively expandable capacity as needed, with a minimum of adverse enivronmental impact on the surrounding populace. (Sinha-OEIS)
W77-04964

SEWAGE TREATMENT APPARATUS,
Peasley (Howard) and Associates, Richmond, Va. (Assignee).
H. P. Peasley, and L. A. McKinney.
U.S. Patent No. 3,984,322, 6 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 260, October 5, 1976.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Water pollution treatment, Domestic wastes, Aerobic treatment, Aeration, Activated sludge, Water purification, Equipment, Aerobic digestion.

An improved sewage treatment apparatus is provided in which the main disposal of the sludge is achieved by bacterial digestion, rather than by mere separation, and in which the mechanical circulation of the sewage ina tank is performed for the purpose of keeping the solid materials from settling while the digestion is in progress and for the purpose of facilitating the drawing off of clarified effluent from the main stream without contamination of the effluent by the solids which are as yet undigested. The improvement is achieved by improving the shape and location of a clarification compartment within the main circulation tank and by providing it with filters, and with vent and effluent exit pipes disposed to achieve optimum clarification of the effluent. (Sinha-OEIS)
W77-04965

APPARATUS FOR PURIFYING POLLUTED WATER,
F. Evens.
U.S. Patent No. 3,984,323, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 260, October 5, 1976.

Descriptors: *Patents, *Water pollution treatment, *Water treatment, *Water pollution control, Water quality control, Aeration, Screens, Jets, Equipment.

The object of the invention is to provide an economic solution to the problem of the purification of polluted water in situ. For this purpose, there is suggested an apparatus comprising the combination of a screen being immerged into the water being treated, means for generating a water jet under the screen relative to the water level, and means for injecting atmospheric air on the water jet. The screen is substantially a porous wall or mesh work and may have various shapes. Good results have been obtained with a sleeve shape, the water jet being produced within the sleeve and in a longitudinal direction. Atmospheric air is suctioned by a compressor-ejector nozzle. In addition it has been found that other products may be injected in the water jet such as gaseous or liquid mixtures of chemical materials in order to influence the pH or the form specific chemical compounds or complexes in the treated water, or with pure oxygen or ozone to promote the chemical oxidation process. (Sinha-OEIS)
W77-04966

GRAVITY FILTERING EQUIPMENT,
Pista S.A., Geneva (Switzerland). (Assignee).
For primary bibliographic entry see Field 5F.
W77-04967

DEVICE FOR EXTRACTING LIQUID FROM SLUDGE,
L. Wenzel, and U. Kollmar.
U.S. Patent No. 3,984,329, 5 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 262, October 5, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Industrial wastes, Sludge treatment, Filtration, Separation techniques, Suspended solids, Solid wastes, Equipment.
Identifiers: *Sludge filtering.

The invention relates to devices for separating the liquid component from suspensions or sludges, and such solid materials as fibers, colloids, and the like, as the sludge is deposited onto a moving perforate conveyor belt which acts as a filter. Devices of this type are particularly useful in connection with the tretment of sewage sludge but may also find application in the paper making industry or in the chemical industry where the liquid component of a suspension or sludge preparation is to be removed in a continuous operation. The sludge filtering device is provided with a substantially horizontal conveyor belt strand onto which the sludge is deposited as a sludge bed, and which, as it moves along, encounters a series of laterally and longitudinally spaced flow breakers, whose purpose it is to prevent the formation of solid material layers in the sludge which would prevent the liquid from flowing downward toward and through the perforate conveyor belt. These flow breakers may be either stationary, or they may be in motion, moving either against the sludge flow or transversely. The moderate turbulence which is created by the flow breakers enhances the floculation action of chemical additives further improving the desired precipitation of the sewage component. (Sinha-OEIS)
W77-04968

A MODEL FOR OXYGEN AND BIOMASS PRODUCTION IN A MASS ALGAL CULTURE,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
F. P. Incropera, and J. F. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 100, Price codes: A05 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 84, January 1977. 74 p, 29 fig, 12 tab, 35 ref. OWRT A-042-IND(1).

Descriptors: *Biomass, *Chorella, *Solar Radiation, Wastewater treatment, Algae, Sewage Lagoon, Photosynthesis, Oxygen, Biological treatment, Forecasting, Model studies, Isolation, Indiana, Cultures.
Identifiers: *Radiation absorption, *Biomass production, Insolation, Oxygen production, Indianapolis(Ind), *Mass algal cultures.

The primary purpose was to develop a model for a reliable method of predicting the yield of a mass culture of unicelluar algae in wastewater treatment ponds. Such algal cultures are capable of producing a high protein food supplement. The model developed determines both oxygen and algal biomass production and is based upon the use of available insolation data. It accounts for spectral effects in the photosynthetically active region, as well as directional effects through delineation of the diffuse and collimated components of the radiation. The effects of the air-water interface are treated, and predictions of the radiation field within the water are used with a representative photosynthesis model to predict the hourly yield. Calculations have been performed for the Indianapolis, Indiana region, and comparisons with field data for similar latitudes reveal that the model is well suited for predicting the maximum yield of mass cultures.
W77-04998

IMPROVED WASTE-TREATMENT SYSTEMS DESIGN BASED ON THE NATURAL THERMAL ENVIRONMENT,
Clemson Univ., S.C. Water Resources Research Inst.
L. G. Rich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 042, Price codes: A05 in paper copy, A01 in microfiche. Report No. 64, July 1976. 90 p, 14 fig, 9 tab, 19 ref, 1 append. OWRT A-035-SC(1).

Descriptors: *Waste water treatment, Environment, *Design criteria, *Design data, *Environmental effects, Environmental engineering, Thermal properties, *Thermal pollution, Waste disposal, Heat budget, Sewage treatment, *Sewage lagoons.
Identifiers: Natural thermal environment, Ground temperature regimes, Biological kinetics.

Low-maintenance, technology-simple, wastewater treatment systems, almost without exception, depend upon biological processes for their effectiveness. During the past 20 years, much information has been revealed about the basic kinetics associated with these processes. It has been found that temperature is one of the most important environmental variables affecting biological waste treatment processes and temperature realtionships with process kinetics have been formulated. Also during this same period of time much information has been published concerning the natural thermal environment and its relationship to meteorological factors such as solar radiation, evaporation, wind velocity, etc. This report brings together the above information and makes it available for use by the design engineer. Specifically, it contains (1) data and methodology for the determination of ground temperatures and the temperatures that would exist in lagoons and other surface waters, (2) the biological kinetics associated with the removal of organic pollutants in lagoons, and (3) information with which the effect that temperature has on biological kinetics can be quantified. Included also are examples in which the methodology for the determination of ground and lagoon temperatures is applied.
W77-05004

PAVING AND ROOFING MATERIALS (TARS AND ASPHALT), POINT SOURCE CATEGORY PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-05062

5E. Ultimate Disposal Of Wastes

LAND APPLICATION OF WASTE MATERIALS.
For primary bibliographic entry see Field 5B.
W77-04607

HANDLING DAIRY WASTES,
For primary bibliographic entry see Field 5B.
W77-04610

STUDIES ON THE COLLECTION AND DISPOSAL OF SLURRY IN NORTHERN IRELAND,
Queen's Univ., Belfast (Northern Ireland). Dept. of Agricultural and Food Chemistry.
For primary bibliographic entry see Field 5D.
W77-04613

FARM WASTE COMPOSTING PROCESS.
For primary bibliographic entry see Field 5B.
W77-04619

HYGIENIC PROBLEMS OF DISPOSAL, TREATMENT AND UTILIZATION OF LIQUID MANURE,
Universitaet Hohenheim (Landwirtschftliche Hochschule (West Germany).
For primary bibliographic entry see Field 5D.
W77-04621

ANALYSIS OF LIQUID MANURE TREATMENT IN HUNGARY, WITH SPECIAL REGARD TO ENVIRONMENTAL PROTECTION,
Research Inst. for Management of Water Supplies Budapest (Hungary).
For primary bibliographic entry see Field 5D.
W77-04622

HYGIENIC PROBLEMS OF LIQUID MANURE TREATMENT ON LARGE-SCALE FARMS OF THE COUNTY TOLNA,
Tolna County Public Health Station, Szekszard (Hungary).
For primary bibliographic entry see Field 5D.
W77-04624

CALIFORNIA CITIES LAUNCH $2 BILLION IN SEWERAGE JOBS.
For primary bibliographic entry see Field 5G.
W77-04665

SEWAGE DISPOSAL SYSTEM,
J. W. Greenleaf, Jr.
United States Patent 3,998,736. Issued December 21, 1976. Official Gazette of the United States Patent Office, Vol. 953, No. 3, p 1155, December, 1976. 1 fig.

Descriptors: *Sumps, *Atmospheric pressure, Sewage, *Patents, *Sewage disposal, Conduits, Negative pressure, Waste disposal.
Identifiers: *Vacuum-type sewage disposal.

A patent was issued for a vacuum type sewage disposal system. The system has two variable volume chambers with movable walls. The first contains a sewage accumulating sump at atmospheric pressure. A discharge conduit, with a negative pressure source, has an open intake end which is normally below the sewage surface. A flow valve is contained in the conduit and is biased to a closed position. The chamber is defined by a means for opening the valve in opposition to its closed position. A control valve is connected to the chamber on the side opposite from the sump. It is movable to a first position which vents the chamber to the atmosphere, and a second which establishes contact between the chamber and discharge conduit. The second chamber is defined by a means which connects it to the control valve to hold it in the second position due to the negative pressure therein. There is another means of returning the control valve to the first position which is responsive to atmospheric pressure in the first chamber. (Collins-FIRL)
W77-04675

AWT AT WOODLANDS, TEXAS,
Houston Univ., Tex. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-04690

KEEPING UP WITH SLUDGE AT WPCF,
For primary bibliographic entry see Field 5D.
W77-04692

SUBSURFACE APPLICATION SOLVES COMMUNITY'S SLUDGE DISPOSAL PROBLEM.
For primary bibliographic entry see Field 5D.
W77-04707

SURVIVAL OF COLIFORM BACTERIA IN SEWAGE SLUDGE APPLIED TO A FOREST CLEARCUT AND POTENTIAL MOVEMENT INTO GROUND WATER,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-04723

IS THERE A 'SLUDGE MARKET',
Culp, Wesner, Culp-Clean Water Consultants, Santa Ana, Calif.
W. F. Ettlich, and A. K. Lewis.
Water and Wastes Engineering, Vol. 13, No. 12, p 40-44, 47, December, 1976. 1 fig, 6 tab.

Descriptors: *Waste water treatment, *Sludge, *Marketing, Publications, *Surveys, Sludge disposal, Economics, Prices, Drying.
Identifiers: Composting, Marketing survey, Air-dried sludge, Heat-dried sludge.

A marketing study, including a literature search, telephone survey, and user survey, was conducted to determine the practicality and desirability of marketing composted waste water sludge. Six metropolitan areas were chosen, three of which presently have such an operation. The literature search revealed that prices for air-dried sludge ($0-20/ton unbagged; $20-60/ton bagged) were higher than competitive products at West Coast prices. Comparison of this to heat-dried sludge was found to be difficult. The telephone and user surveys revealed that most people were willing to use sludge compost if it were competitively priced and if they could have a sample for testing. Some would use it instead of fertilizer, but it was felt that compost might not meet their needs. Users accept the product, have few complaints, and many become repeat customers. Demand has remained high. It was found that no significant surveys had been made in present market areas. The study proved that, in these areas, the operation's success depended on: favorable local publicity, ease of pick-up or delivery, guidelines or suggestions for use, free or low-cost products, and a trade name for the product. It was felt that a demonstration project would speed public acceptance and use of sludge compost. (Collins-FIRL)
W77-04727

GROUNDWATER POLLUTION FROM A SEPTIC TILE FIELD,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04728

EFFECT OF MUNICIPAL LANDFILL LEACHATE ON MERCURY MOVEMENT THROUGH SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W77-04729

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, Mich. Hiawatha National Forest.
For primary bibliographic entry see Field 5B.
W77-04756

EXPERIENCES WITH THE THICKENING AND BURNING OF BIOLOGICAL AND NON-BIOLOGICAL SLUDGES (ERFAHRUNGEN BEI DER ENTWAESSERUNG UND VERBRENNUNG VON BIOLOGISCHEN UND NICHT-BIOLOGISCHEN SCHLAEMMEN),
Cellulose Attisholz A. G. (Switzerland).
A. Scherler.
Das Papier, Vol. 30, No. 11, p 471-478, November, 1976. 7 fig, 3 illus, 11 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Pulp and paper industry, Effluents, Foreign countries, Europe, Dewatering, *Incineration, Legislation, Planning, Biological treatment, Biochemical oxygen demand, Chemical oxygen demand, Steam, Electric power.
Identifiers: Sulfite pulp mills, Switzerland.

The experience of Cellulosefabrik Attisholz AG., a sulfite pulp mill in Luterbach, Switzerland, in meeting Swiss environmental legislation is sketched. The report covers the planning and commissioning period for the mechanical-biological effluent purification plant and sludge disposal by dewatering and incineration in a fluidized-bed burner. Results obtained with these control measures are tabulated. Initial operating results show the developed effluent treatment system to reduce BOD by about 93% and COD by almost 30S%. The sluge incineration system produces a maximum of 8700 kg of steam/hr at a power consumption of 4776 kw-hr/day. (Ward-IPC)
W77-04814

RECYCLING SEWAGE WASTE RESOURCES AND SOIL AMELIORATION,
Forest Service (USDA), Washington, D. C.
J. O. Evans.
In: Timber Bulletin for Europe, Vol 28, Supplement 4, Papers presented to the Symposium on Forests and Wood: their role in the Environment, Interlaken, September, 1975, Part II, p 145-152, United Nations, Geneva, Switzerland, February, 1976. 2 fig, 16 ref.

Descriptors: *Sewage sludge, *Industrial wastes, *Waste disposal, *Irrigation water, Sewage, Soil amendments, Groundwater recharge, Watershed management, Municipal wastes, *Recycling.

Treated municipal sewage residues (including sludges) as well as industrial effluents are commonly used today for agricultural irrigation and soil amendment in the United Kingdom, USSR, United States, Japan, Israel, and other countries. Benefits include increased vegetative growth, added irrigation water, groundwater recharge, amelioration of disturbed unproductive lands, enhanced watershed quality, and protection of natural resources. Drawbacks of land disposal of effluents are minimal. Although sewage is an ideal resource for recycling, proper application should be dictated by total ecosystem response. (Brown-IPC)
W77-04827

WASTE DISPOSAL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
G. Gross.
MESA New York Bight Atlas Monograph No 26, July 1976. 33 p, 8 fig, 10 tab, 60 ref, 9 map. Also as New York Sea Grant Institute Report No. NYSSGP-AM-76-009

Descriptors: *Waste disposal, *Sewage sludge, *Estuaries, *Harbors, New York, New Jersey, Benthos, *Environmental effects, Municipal wastes, Industrial wastes, Sedimentation, Hudson River, Ecosystems.
Identifiers: *New York Bight, *Ocean dumping, Marine ecosystems analysis.

Waste solids (dredge spoil, rubble, sewage sludge, and industrial sludge) are dumped at six major disposal sites in New York Bight. Waste disposal has been regulated since about 1890. Discharges of waste solids into the Bight in 1975 were: dredge spoil, 5 million metric tons; rubble, 1.2 million metric tons; industrial sludges, 0.3 million metric

tons; and sewage sludge, 0.3 million metric tons. Amounts of waste solids discharged increased between 1968 and 1975 although the number of individual disposal black color, human artifacts, high carbon content (greater than 2% carbon), and metal content (high in silver, copper, chronium, and lead). In the axis of Hudson Channel, waste deposits locally are over 15 m (50 ft) thick and cover more than 150 Km2(60 mi2). The head of Hudson Channel has been filled by waste deposits. This physical alteration of the bottom has caused obvious changes in abundance and distribution of bottom-dwelling organisms. Accumulations of sewage sludges on the ocean bottom are associated with diseases in crustacea and fin erosion in certain bottom dwelling fishes. Low dissolved oxygen concentrations occur in the disposal areas during late summer. (NOAA)
W77-04847

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART 12: BIOENHANCEMENT STUDIES OF THE RECEIVING WATERS IN OUTER LOS ANGELES HARBOR,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W77-04849

ORGANIC LEACHATE THREATENS GROUNDWATER QUALITY,
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5B.
W77-04870

RESIDUAL WASTE: MODEL STATE LEGISLATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
For primary bibliographic entry see Field 5G.
W77-04905

LABORATORY EXPERIMENTS ON THE EFFECTS OF OCEAN DUMPING ON BENTHIC INVERTEBRATES. I. CHOICE TESTS WITH SOLID WASTES,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W77-04949

WET COMBUSTION OF ORGANICS,
Dow Chemical Co., Midland, Mich. (Assignee).
For primary bibliographic entry see Field 5D.
W77-04957

PROCESS FOR INSOLUBILIZING POTENTIALLY WATER POLLUTABLE WASTES FROM SODIUM OR AMMONIUM TYPE SULFUR DIOXIDE AIR POLLUTION CONTROL SYSTEMS,
Industrial Resources, Inc., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5D.
W77-04958

SALINE WATER IN THE LITTLE ARKANSAS RIVER BASIN AREA, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-04979

COAL-RESOURCE DEVELOPMENT ALTERNATIVES, RESIDUALS MANAGEMENT, AND IMPACTS ON THE WATER RESOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. D. Steele.
Paper presented at Symposium on Water Resources and Fossil Fuel Production, held in Dusseldorf, Germany, September 7-8, 1976: International Water Resources Association, 1976. 14 p, 1 fig, 1 tab, 17 ref.

Descriptors: *Water pollution control, *Coal mine wastes, *Environmental effect, *Watershed management, *Rocky Mountain region, Colorado, Wyoming, Model studies, Planning, Evaluation.
Identifiers: *Yampa River basin(Colo-Wyo), Residuals management.

Development of coal resources in the Yampa River basin in the southern Rocky Mountains of the United States will have a variety of effects on available water resources. These involve both direct effects caused by coal extraction, processing, transport, and conversion techniques utilized or proposed for the region and also indirect effects associated with regional economic growth. Impacts from both types of effects involve water resources of the basin in terms of water withdrawals, consumptive use, and assimilative capacities of discharged residuals (that is, noneconomic byproducts). A regional residual-management analysis involves assessing mass and energy balances of the primary economic activities, as well as an economic and technical evaluation of alternative strategies of treatment and modification of residuals discharged to the environment from various sources. Approaches and results to date of residuals-management and environmental-modeling techniques are described for evaluating water-resources impacts of coal-related development in the Yampa River basin, Colorado and Wyoming. (Woodard-USGS)
W77-04994

NITROGEN AND METAL CONTAMINATION OF NATURAL WATERS FROM SEWAGE SLUDGE DISPOSAL ON LAND,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-05002

OCEAN DUMPING--PART 2.
Joint Hearings---Sub Comm on Fisheries and Wildlife Conservation and the Environment and Sub Comm on Oceanography Comm on Merchant Marine and Fisheries, US H Rep, January 23, 29, February 27, 1976. p 1-378.

Descriptors: *Waste dumps, *Sludge disposal, *Oceans, *Sewage sludge, *Waste water disposal, *Waste water treatment, Waste water(Pollution), Estuaries, Coasts, Water permits, Rivers, Regulation, Sludge treatment, Sludge, Treatment, Treatment facilities, Water pollution effects, Water policy, Water pollution control, Water pollution treatment, Water quality control, Waste disposal, Water, Pollution.
Identifiers: Coastal waters, *Congressional hearings, *Ocean dumping.

The Marine Protection, Research and Sanctuaries Act of 1972, more commonly known as the Ocean Dumping Act, is intended to assist in cleaning up U. S. estuaries, rivers and coastal waters and eventually to eliminate the dumping of waste material into the ocean. Four federal agencies are involved in administering the Act. The Environmental Protection Agency (EPA) is vested with authority to regulate the ocean dumping of all waste material other than dredged material subject to control by the Army Corps of Engineers. The Coast Guard reports violators of dumping permits to the EPA and the Attorney General. The National Oceanographic and Atmospheric Administration researches environmental effects of dumping and recommends solutions. To determine the effectiveness of the Act, the House Subcommittees on Oceanography and on Merchant Marine and Fisheries recently held public hearings. Maladministration of the Act, insufficient funding, inadequate Coast Guard surveillance of ocean dumping operations, and the lack of proposed alternative solutions to sludge dumping are among the problems impairing the Act's potential effectiveness. (See also W76-07860) (Josepher-Florida)
W77-05037

5F. Water Treatment and Quality Alteration

AN EVALUATION OF LAND TREATMENT OF MUNICIPAL WASTE WATER AND PHYSICAL SITING OF FACILITY INSTALLATIONS,
Office of the Chief of Engineers (Army), Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-04635

A BENEFIT/COST EVALUATION OF DRINKING WATER HYGIENE PROGRAMS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Science.
J. E. Singley, A. W. Hoadley, and H. E. Hudson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 891, Price codes: A07 in paper copy, A01 in microfiche. Report to EPA Office of Water Supply, Washington, D.C., November, 1975. 136 p, 3 fig, 27 tab, 101 ref, 5 append. 68-01-1838.

Descriptors: *Analytical techniques, *Cost-benefit ratio, *Water treatment, *Mathematical models, *Regression analysis, Salmonella, Shigella, Human diseases.
Identifiers: *Water hygiene, Salmonellosis, Shigellosis, Hepatitis.

A methodology has been developed to evaluate the benefit/cost ratio of water hygiene programs. It is based upon regression models. The number of water-related disease cases is estimated by estimating regression equations relating the rate of reported cases of infectious disease to the quality of drinking water and other factors and estimating how changes in water quality will change the number of cases reported. This methodology has been used to evaluate the benefit/cost ratio for water quality improvements affecting the incidence of salmonellosis, shigellosis, and hepatitis. First, the total disease and cost per incidence of disease was measured. A regression equation was then estimated to explain the reported rate of disease and water quality. Costs of a given water quality improvement program were then estimated. The benefits of improvement programs were then determined in terms of infectious disease using the cost per incidence of disease and estimated regression equation. Cost/benefit ratios were then determined. The regression methodology can be used for other water programs if appropriate data is available. (Snyder-FIRL)
W77-04639

THE COST OF MUNICIPAL WATER SUPPLY: A CASE STUDY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. M. Clark, R. Stevie, and G. Trygg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 960, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/2-76-179, July 1976. 42 p, 8 fig, 13 tab, 5 ref.

Descriptors: *Treatment facilities, *Cost analysis, Economics, *Management, *Planning, Utilities, *Water supply, Systems analysis, *Municipal water.

Water supply problems have become increasingly important recently. Spreading urban boundaries force many potential customers to locate farther from available water sources. Therefore, studying factors affecting the costs of water supply management is important. These factors are examined for the Cincinnati Water Works, Cincinnati, Ohio, and the application of a functional approach to the analysis of water supply costs is documented. This approach provides the basis for determining the cost of service for any given consumer within the Water Works service area. Ultimately this or a similar approach will of necessity be used to analyze the impact of regional water supply systems. Costs are defined functionally for support services, acquisition, purification, power and pumping, and transmission. Operating and maintenance, capital, and labor costs are evaluated. Manpower costs are significant and play an increasingly important role in the total cost of water as delivered to the consumer. As water is pumped from treatment plant to consumer, costs are added, increasing with respect to distance from the central supply. Cost zones are developed for the Water Works service area. Actual charges and construction costs are compared for the Water Works' 10 largest water users. The basic principles discussed apply to all water supplies. They must be considered in planning and designing water systems; the functional analysis is extremely important for regional considerations. (Snyder-FIRL)
W77-04643

VIRUS ELIMINATION IN WATER AND WASTEWATER,
Naval Coastal Systems Lab., Panama City, Fla.
For primary bibliographic entry see Field 5D.
W77-04648

DETERMINATION OF RADIUM REMOVAL EFFICIENCIES IN IOWA WATER SUPPLY TREATMENT PROCESSES,
Iowa Dept. of Environmental Quality, Des Moines.
R. J. Schliekelman.
Technical Note ORP/TAD-76-1 to EPA Office of Radiation Programs, Las Vegas, Nevada, June 1976. 212 p, 47 fig, 67 tab, 31 ref, 1 append. EPA 68-03-0491.

Descriptors: *Pollutant identification, *Treatment facilities, *Radioactivity, *Potable water, *Water treatment, *Radium radioisotopes, *Iowa, Water supply.
Identifiers: Natural radioactivity, *Radium removal.

Water from municipal water treatment plants in Iowa was sampled and analyzed to determine the efficiency of radium-226 removal in various treatment processes and provide cost data for these processes. Supplies with a high naturally occurring radium content over 5 pCi/liter in Jordan and Dakota sandstone formation well water were selected. Reverse osmosis, iron removal filtration, sodium ion exchange, and lime-soda ash softening were studied. Radium-226 removals through reverse osmosis, sodium ion exchange, and lime-soda ash softening plants were in the range of 95%. Hardness removals with reverse osmosis and ion exchange were generally nearly identical to radium removal. The soda ash shortage caused considerable variation in hardness and radium removals in lime-soda ash softening; generally, radium removals were greater than hardness and iron removals. Radium removal in iron removal plants ranged from 12 to 38%. Total annual capital and operation costs and plant operation and maintenance costs were highly variable and typical cost data could not be developed. (Snyder-FIRL)
W77-04652

NO SEWERS--NO GROWTH,
For primary bibliographic entry see Field 5G.
W77-04666

SEWAGE TO AID CITY POWER PLANT.
For primary bibliographic entry see Field 5D.
W77-04697

GETTING MORE FROM A LIMITED NATURAL RESOURCE.
For primary bibliographic entry see Field 6E.
W77-04911

APPARATUS FOR PURIFYING POLLUTED WATER,
For primary bibliographic entry see Field 5D.
W77-04966

GRAVITY FILTERING EQUIPMENT,
Pista S.A., Geneva (Switzerland). (Assignee).
H. Bendel.
U.S. Patent No. 3,984,326, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 261, October 5, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Filtration, Water quality control, Filters, Carbon filters, Waste water treatment.
Identifiers: *Gravity filters.

A gravity filtering apparatus is comprised of a basin partitioned into compartments each having a permeable bottom covered by a filtering bed and a device for flushing such filtering beds. The flushing device comprises a bell adapted to fit fluid-tight onto the upper edges of each compartment in turn and is provided with a pump for sucking up filtered water, from a collecting chamber provided underneath the permeable bottom of each such compartment through its filtering bed. The flushed fluid is evacuated through a conduit. (Sinha-OEIS)
W77-04967

COAL-RESOURCE DEVELOPMENT ALTERNATIVES, RESIDUALS MANAGEMENT, AND IMPACTS ON THE WATER RESOURCES OF THE YAMPA RIVER BASIN, COLORADO AND WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5E.
W77-04994

ADSORPTION AS A PROTECTIVE MECHANISM FOR WATERBORNE VIRUSES,
Maine Univ., Orono. Dept. of Civil Engineering.
O. J. Sproul, and G. D. Boardman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 049, Price codes: A06 in paper copy, A01 in microfiche.University of Maine Land and Water Resources Institute, Completion Report, January 1977. 103 p, 1 fig, 38 tab, 42 ref. 3 append. OWRT A-030-ME(1).

Descriptors: *Adsorption, *Bacteriophage, Chlorine, *Disinfection, Protection, *Viruses, *Chlorination, Water treatment.
Identifiers: Poliovirus, Protective Mechanisms(Adsorption), Quantitative Recovery, Viral Aggregates.

The phenomenon of viral association with solids has been demonstrated by several investigators, and it has been shown that the majority of viruses in the natural environment exist in an adsorbed state. The principal objectives of this research were to ascertain levels of association in a given virus-adsorbent system, develop techniques for the quantitative recovery of adsorbed virus, determine if particulates afforded protection to associated virus from disinfection, and investigate the nature of any existing protective mechanisms. Results indicated that T7 bacteriophage and poliovirus associated readily with particulates of each adsorbent system. Direct application of the soft agar overlay technique made it possible to quantitatively recover T7; recovery of poliovirus was accomplished through alkaline overlay enumeration procedures. None of the particulate systems investigated seemingly protected T7 phage from inactivation by chlorine. A free chlorine dosage resulted in 99.998, 99.98, 99.55 and 99.98 percent inactivations, for these systems. However, some evidence indicated that T7 was more stable to mechanical disruption, elevated pH, and low ionic strength due to its association with solid matter. Conversely, poliovirus was protected to some degree from inactivation by chlorine in each of the adsorbent systems; inactivations were approximately 97.3, 95.8, 78.4 and 84.7 percent. A similar hierarchy of protection was demonstrated at a variety of disinfectant levels. Although viral aggregates would logically seem affiliated with the protective mechanism observed, sucrose gradient, sedimentation rate, and gel filtration analyses failed to demonstrate their involvement.
W77-04997

5G. Water Quality Control

HYDROLOGY AND WATER QUALITY IN THE CENTRAL KENTUCKY KARST: PHASE I,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5B.
W77-04602

EPA SETS FINAL RULES ON FEEDLOT PERMITS.
Wallaces Farmer, Vol. 101, No. 8, p. 42, April 24, 1976.

Descriptors: *Regulation, *Permits, *Water pollution control, *Farm wastes, Waste disposal, Water quality standards, Pollution abatement.

Final regulations that establish the conditions under which feedlots will need waste water discharge permits have been issued by the Environmental Protection Agency. About 3,240 livestock operations nationwide will need a permit under these regulations. In the final regulations, operations that do not discharge pollutants into navigable waters will not need a permit. But feeding operations will need a permit if there is a discharge of pollutants and their operations have more than 1000 slaughter and feeder cattle, 700 mature dairy cattle, 2,500 swine weighing over 55 lb., 500 horses, 10,000 sheep and lambs, 55,000 turkeys, 100,000 laying hens or broilers (continuous overflow watering), 30,000 laying hens or broilers (liquid manure handling), 5,000 ducks, or 1,000 animal units. An animal unit is a way to measure an operation that involves several types of livestock. A feedlot with 301-999 animal units will also need a permit if the facility discharges pollutants by means of a man-made conveyance or discharges into waters that pass through or have contact with animals. This includes operations larger than: 300 slaughter or feeder cattle, 200 mature dairy cattle, 750 swine over 55 lb., 150 horses, 3,000 sheep, 16,500 turkeys, 30,000 laying hens or broilers (continuous overflow watering), 9,000 hens or broilers (liquid manure handling), 1,500 ducks, or 300 animal units. This size feedlot may also need a permit if designated by the EPA or Department of Environmental Quality as requiring one. Livestock producers who will need a permit should file a short form B by September 1, 1976. (Ott-East Central)
W77-04603

NEW EPA PROPOSALS FOR FEEDLOT RUNOFF TAKE REASONABLE APPROACH,
R. D. Wennblom.
Farm Journal Vol. 100, No. 1, p. G3, January, 1976.

Descriptors: *Water pollution control, *Feed lots, *Agricultural runoff, *Regulation, *Permits, *Farm wastes, Pollution abatement.
Identifiers: *Exemption(Waste disposal).

The Environmental Protection Agency (EPA) is now taking a more reasonable approach to the possible pollution of streams by farm and feedlot runoff. Latest indication of this change in attitude came during a discussion of which size animal feedlots will require a wastewater permit. EPA Deputy Administrator John R. Quarles Jr. said that 'EPA doesn't want to have to go out and regulate every feedlot'. EPA has already prepared an exemption amendment and sent it to the White House for clearance before it goes to the Congress. Last March, in a suit brought by National Resources for Defense, Inc. (NRDC), the court ruled that the Corps of Engineers is responsible for all 'the waters of the U.S.', not just the navigable waters. This decision gives the Corps authority over practically every natural and artificial body of water in the country, including farm ponds and streams where normal flow is 5 or more cubic feet/second. Next, NRDC challenged EPA's ruling that only the largest agricultural operations require a permit for the discharge of their wastewater into navigable streams. On June 10, 1975, the court ruled that EPA cannot exempt an animal feedlot or another agricultural operation simply because it's small. Forced to comply with this court order, EPA has now proposed new regulations to spell out the conditions under which concentrated animal feeding operations would be required to get a wastewater permit. Under EPA's latest proposals a permit would not be needed unless more than 1,000 slaughter and feeder cattle, 700 mature dairy cows, 4,500 slaughter hogs, 12,000 sheep or lambs, 55,000 turkeys, 180,000 laying hens, or 290,000 broilers are confined for 45 days or more during a 12-month period. Otherwise, a permit would not be needed unless 'measurable wastes' are discharged directly into: (1) navigable waters that run through the feedlot; or (2) navigable waters by means of man-made pipe, ditch or flushing. A feeding facility, no matter what size, will require a permit if EPA and state authorities decide that it's a significant source of pollution. (Ott-East Central)
W77-04604

BILL PROTECTS FARMS FROM NUISANCE SUITS,
J. Carlson.
Wallaces Farmer, Vol. 101, No. 8, p. 41, April 24, 1976.

Descriptors: *Regulation, *Legal aspects, *Iowa, *Air pollution, *Water pollution, Management, Odor, Feed lots, *Farm wastes, Legislation.
Identifiers: *Nuisance suits.

A bill (Senate file 367), currently in the Iowa legislature could help protect livestock producers from nuisance suits. One section of the bill says, basically, that whoever is there first is right. However, if the cattle feeder expands his operation and is then sued, he loses his protection and could be liable to the degree of his expansion. The producer's protection is good as long as he meets environmental regulations. The bill also tries to protect livestock producers from regulation changes. If a producer has to make a management change (one that costs less than 2 percent of the cost of establishing the facility) to control an odor problem on a facility that's less than 10 years old, he has 2 years of exemption. If the facility is older than 10 years, he has a one-year exemption. If a producer is faced with a design change (one that costs more than 2 percent of the cost of building the facility) for air quality on a facility less than 10 years old, he has a 10-year exemption from the change. If the facility is older than 10 years and he doesn't have a feedlot permit, the operator gets a 5-year exemption. If he has a feedlot permit, the length of his exemption from the change is the same as the time remaining on his feedlot permit. Exemptions from changes in water quality regulations are also included. A nonpermit holder would get an exemption of either 5 years from the change, or 10 years from when the facility was established, whichever is greater. A producer with a feedlot permit gets either 10 years from when the facility was built or the time remaining on his permit, whichever is greater. Senate file 367 says a feedlot should be exempt from both city and county zoning changes for 10 years from date of change. However, this doesn't apply to livestock operations currently within the city limits. (Merryman-East Central)
W77-04605

FEEDERS WARNED STATE, LOCAL RULES ON POLLUTION ARE COMING THREAT.
Beef, Vol. 12, No. 7, p. 11, March, 1976.

Descriptors: *Regulation, *Feed lots, *Legal aspects, *Permits, Agricultural runoff, Cattle, Costs, *Farm wastes, Pollution abatement.
Identifiers: *Impact statements.

A recent report submitted by John Sweeten, Texas A and M agricultural engineer, to the American National Cattlemen's Association asserted that cattlemen must meet 2 criteria to head off environmentalists' pursuit of beef feedlot waste restrictions. Cattlemen must do a good job of preventing pollution from their operations and they must become politically involved. Sweeten told the ANCA that recently proposed rules concerning discharge permits were substantially influenced by the input of cattlemen. One area with which feedlot owners should become concerned is the construction of new beef feedlots. An EPA requirement that new feedlots file an economic impact statement could delay construction as much as 3 years. 'Front end' costs such as hiring outside consultants for such construction are difficult to finance. There are e alternatives to filing an economic impact statement: (1) Congressional action to eliminate the requirement for an environmental impact statement, (2) Get states certified to issue permits, so the impact statements would not be required, and (3) Avoid being classified as a 'new' source of pollution by staying under 1,000 head, buying an existing lot, or building plenty of runoff storage capacity. Sweeten also warned that cow-calf men are about to get their first exposure to EPA rules, as the federal government starts working on 'non-point source pollution' wich will eventually involve every non-feedlot cattle operation in the country. (Penrod-East Central)
W77-04606

AGRICULTURE'S CONTRIBUTION TO THE SOLID WASTE PROBLEM,
S. A. Hart.
Water, Air, and Soil Pollution, Vol. 4, No. 2, p. 189-190, May, 1975.

Descriptors: *Agriculture, *Solid wastes, *Water pollution sources, *Economics, Pollution abatement, *Farm wastes.
Identifiers: *Waste management.

Waste is a by-product of productivity. For every pound of beef produced, 25 bls of manure is produced. Poultry is lower at only 8 lb/lb meat and fruit is even less at from 1 to 5 bls of crop residue wastes left in the field for every pound of plant material for consumption. The same five steps are used in the management of agricultural wastes as those used in the management of any other waste commodity. The waste must be properly stored, collected, transported, processed, and discharged without degradation of the environment. Since the farmer doesn't willingly want to spend the money necessary for proper management, agricultural waste management is not always successfully completed. The most widespread, hazardous waste material, pesticides, is associated with agriculture. Although the crops are harvested and consumed, pesticide residues linger. Steps have been taken to alleviate the problem. This shows that as in other agricultural wastes, the technology exists to properly dispose of the waste. The reason the farmer doesn't utilize such technology is the economic expenditures associated with such technology. Only when the consumers demand a specific level of pollution control applied equally to all farmers will agriculture as a whole more properly manage its wastes. (Merryman-East Central)
W77-04608

FINAL POLLUTION RULES RELEASED,
F. Girres.
Feedstuffs, Vol. 48, No. 11, p. 5, March 15, 1976.

Descriptors: *Water pollution sources, *Feed lots, *Regulation, Water quality standards, *Farm wastes, Pollution abatement.

The Environmental Protection Agency has released its final regulation defining the conditions under which animal feeding operations are considered point sources of pollution and must obtain a wastewater discharge permit. Essentially the final regulation is a three-tiered definition that designates animal feeding operations as point sources of pollution according to size. Criteria for permit requirements are divided into 3 categories: for operations with 1,000 or more animal units; for operations with more than 300 but less than 1,000 animal units, and for operations with less than 300 animal units. The basic provisions of the regulation are: (1) Feeding operations with 1,000 or more animal units must obtain a permit if there is a discharge of pollutants into navigable water. (2) Feeding operations of 300-1,000 animal units are required to obtain a permit if the facility discharges pollutants through a man-made conveyance constructed for that purpose, or there is discharge into waters that pass through or come into direct contact with animals in the confined area. (3) Feeding operations of less than 300 animal units do not require individual discharge permits. Feeding operations that fall into either of the latter 2 categories that do not meet the criteria for discharge permits may still be designated point sources of pollution and require a permit if EPA determines that they are significant polluters. (Penrod-East Central)
W77-04609

ECONOMICS AND TECHNOLOGY FOR CONTROLLING DAIRY FEEDLOT RUNOFF,
Soil Conservation Service Hyattsville, Md.
R. L. Phillips, and M. R. Overcash.
Presented at the 1976 Annual Meeting, American Society of Agricultural Engineers, University of Nebraska, June 27-30, 1976, Paper No. 76-4032, 26 p. 2 fig, 8 tab, 10 ref.

Descriptors: *Agricultural runoff, *Feed lots, *Dairy industry, *Economics, *Technology, *Costs, Soil types, Climate, Topography, Nitrogen, Irrigation, Waste storage, *Farm wastes, Pollution abatement.
Identifiers: Herd size.

Research objectives were: (1) Determine various design elements that should be considered in specifying a rainfall runoff pond for a dairy, (2) Prepare a field design, economic analysis, and operational recommendation for several dairy units representing (3) subregions in the Southeast, and (3) Assess the relative economic impact of compliance on a dairy and the impact of altering existing facilities or of building a completely new system. Factors affecting the cost of no discharge systems are: soils to be irrigated, climate, topography, building location and construction, herd size, crops irrigated, and method of harvest. Typical farms were studied on each of the following: (1) Mountain subregion -- moderately shallow soils of ridges; (2) Mountain subregion -- moderately deep and deep soils of broad valleys and basin; (3) Piedmont -- firm clayey solid on felsic rocks; (4)

Coastal Plains -- loamy and clayey soil of smooth uplands, and (5) Coastal Plains -- loamy and clayey soils of wer lowlands. These case studies revealed that the economic impact on the dairy farmer aries mainly with herd size and with yearly milk production. The cost of feedlot runoff control varies from 10 cents per hundred weight for large herds to 27 cents for small herds. Initital investment of controlling feedlot runoff ranges from $55-$154 per cow. Annual cost ranges from 412-$30 per cow, depending on herd size. Costs are highest for small farms. Building location and feedlot layout are the most important factors affecting cost. Nitrogen was found to govern the size of the irrigation dispoal on all 5 study farms. Fixed area for disposal is the most economical. Climate has little affect on costs, Tripling storage capacity from 1 month's capacity to 3 months' capacity increases annual costs by one percent, but increased flexibility of management makes the increase worthwhile. (Rowe-East Central)
W77-04611

THE SWEDISH EXPERIENCE IN CONNECTION WITH ENVIRONMENT PROTECTION AT ANIMAL PRODUCTION SITES,
National Swedish Environment Protection Board, Stockholm.
S. Berglund.
In: Managing Livestock Wastes, Proceedings 3rd International Symposium on Livestock Wastes - 1975, University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 627.

Descriptors: *Regulation, *Legal aspects, *Water pollution control, Odor, *Farm wastes.
Identifiers: *Sweden, *Environmental protection.

The Swedish Environment Protection Act of 1969 specifically prohibited some forms of pollution, such as the discharge of animal and silage effluent into streams and lakes. In 1973, the 1969 Guidelines for Environment Protection at Animal Production Sites were revised in terms of location of new animal units, requirements of cultivated land area to number of animals, and manure storage and handling requirements. These new requirements are supervised and enforced by provincial administrators. Investigations on different methods of reducing odors from spreading manure, along with emissions from animal stables and water pollution problems are being carried out. Cooperation among authorities, local agricultural advisors, and farmers' unions has been successful. (Edwards-East Central)
W77-04614

WASTE TREATMENT RULES WON'T PUT 'IMPOSSIBLE' BURDENS ON PRODUCERS,
J. McClung.
Feedstuffs, Vol. 48, No. 31, p. 2, August 2, 1976.

Descriptors: *Waste treatment, *Feed lots, *Agricultural runoff, *Legal aspects, *Farm wastes, Water pollution control, Pollution abatement.
Identifiers: *1972 Federal Water Pollution Control Act.

Section 208 of the 1972 Federal Water Pollution Control Act requires beef and other livestock producers to use the best possible management procedures but, according to a panel of EPA and USDA specialists, it will not put an impossible burden on these producers. Section 208 is a program which will attempt to get cooperation among local governments in a particular area to find ways where common water problems, too severe or complex for technology solving alone, can be solved. Pollution factors in a given point may include (1) point and nonpoint sources, (2) industrial-municipal pollutants, and (3) agricultural runoff. In addition to agricultural runoff, this plan will speak to foresty, mining, and construction activities and the intrusion of salt water into groundwater supplies due to the reductions in the flow of fresh water from any cause. The 1972 act works in the following way. Governors of states decide which areas in their state need 208 planning. Then designated areas have an agency created with members which include elected officials from the local governments concerned. These men then plan for waste water treatment. Their goal is to have all the treatment works necessary to maintain acceptable water quality over a 20-year period. Once approved by the EPA, federal funds are available to the planners. To minimize water pollution problems with as little federal involvement as possible is the intent of the 208 program. Because of the few options available to ranchers on waste control, cow-calf operations should not be affected. (Edwards-East Central)
W77-04616

NORTH CAROLINA SWINE OPERATION SOLVES ODOR, WASTEWATER PROBLEMS,
R. H. Brown.
Feedstuffs, Vol. 47, No. 48, p. 34-36, 38, November 24, 1975. 3 fig.

Descriptors: Management, *Design, *Odor, *Waste water treatment, *Aeration, *Lagoons, Anaerobic conditions, Irrigation, Denitrification, Oxygen demand, Water pollution, Feed lots, *North Carolina, *Hogs, *Farm wastes, Waste disposal.
Identifiers: *Land disposal.

Lexington Swine Breeders, Inc. developed some disposal and odor problems which were compounded by the building of a large furniture factory and several new homes nearby. The manager of Lexington Swine Breeders, Inc., Dr. George Wetherill, secured the assistance of 4 faculty members of North Carolina State University who helped develop a satisfactory waste management system. The plan called for the emptying of 1 of 4 manure pits (1 pit for each swine house) into a newly built aerobic lagoon. Here the odors were eliminated and the oxygen demand, organic carbon, and solids loading were reduced. The wastes then went into an anaerobic lagoon. This aerated-unaerated treatment sequence provided a suitable condition for biological denitrification or nitrogen removal. Since nitrogen is usually the limiting factor in determining the amounts of wastes or wastewaters to be applied to fields, there was great advantage in this. The wastewater was then sprinkler irrigated out on pasture land about 1-1/2 hours a week. A creek, which had run through the feedlot, was diverted around the feedlot into a larger creek in order to prevent it from being polluted any longer. The system seems to be working quite effectively. (Rowe-East Central)
W77-04618

FARM WASTE COMPOSTING PROCESS.
For primary bibliographic entry see Field 5B.
W77-04619

LARGE-SCALE MANAGEMENT SYSTEMS AND ENVIRONMENTAL PROTECTION,
Wyzsza Szkola Rolnicza, Wroclaw (Poland).
M. Cena.
In: Progress in Animal Hygiene, F. Kovacs and P. Rafai, (ed). Budapest, Akademiai Kiado, 1975. p 63-65.

Descriptors: *Farm wastes, Waste storage, Public health, Environment, Disinfection, Waste treatment.
Identifiers: *Waste management, *Environmental protection.

All changes in the composition of soil, water, air and animal feed affect in due course man, who thus has to face not only the favorable but also the unfavorable consequences of his interference with the laws of nature. Thus the responsibility of the animal hygienist for the protection of human environment is multiple and great. His cooperation is wanted in the prevention of soil and water pollution by the wastes of large-scale animal production and he has the major share in establishing appropriate methods for the reduction of the bacterial load in liquid manure by disinfection in order to prevent the mediation of pathogenic agents to man and animals. Apart from the bacteriological, epidemiological and epizootological aspects, the disposal and handling of liquid manure present a score of other problems in respect to storage and utilization. Liquid manure may provide a haven for the eggs of many insects and pests. It also may be the source of obnoxious odors. (Merryman-East Central)
W77-04623

KEARNEY FEEDER'S EARLY EFFORT EARNS ENVIRONMENTAL AWARD.
Nebraska Farmer, Vol 118, No 14, p 18, July 17, 1976. 2 fig.

Descriptors: *Management, *Feed lots, *Design, *Farm wastes, Environment, Pollution abatement, Water pollution control.
Identifiers: Holding ponds, Land disposal.

Lewis Feedlot, Inc. won the third annual J. L. Higgins Award for outstanding efforts in controlling livestock waste. Between $150,000 and $200,000 was spent on construction of the 4 waste control systems in use on a 160-acre feedlot. The feedlot is located on flat valley land adjacent to the Wood River northeast of Kearney. All the rainfall that falls on that lot had to be controlled so it wouldn't flow into the river. The difficulty was overcome by building mounds at the center of each pen in the feedlot and sloping the land away from the feed bunks toward the other side of the lot, where the drainage ditches channel wastes into holding ponds. Several wire-screened debris traps made of hardware cloth were located in the drainage ditches to separate solid from liquid wastes and slow the liquids. From the holding pond, an electrical pump is used to pump the liquid wastes through gated pipeline so it can be distributed down rows on cropland whenever the pond requires emptying. Solid wastes are spread on the cropland as fertilizer. The Lewis farm unit includes about 1,200 acres of irrigated land and 600 acres of dryland. Corn lot silage is the main crop. (Rowe-East Central)
W77-04628

IMPACT OF FERTILIZERS AND AGRICULTURAL WASTE PRODUCTS ON THE QUALITY OF WATERS.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 5B.
W77-04629

A BENEFIT/COST EVALUATION OF DRINKING WATER HYGIENE PROGRAMS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Science.
For primary bibliographic entry see Field 5F.
W77-04639

STORMWATER MANAGEMENT LOOKS TO NATURAL DRAINAGE.
For primary bibliographic entry see Field 4A.
W77-04653

ARGULUS IN THE LAKE OF GENEVA, (IN FRENCH),
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologie Lacustre.
For primary bibliographic entry see Field 2H.
W77-04655

LIMNOLOGICAL DATA AND THEIR USE IN PRACTICAL WATER MANAGEMENT, (IN GERMAN),
Institut fuer Wasserwirtschaft, Magdeburg (East Germany).
H. Klapper.
Limnologica 9(3), p 427-441, 1975.

Descriptors: *Limnology, *Lakes, Management, Eutrophication, *Recreation, Economics, Water management(Applied), Water pollution.
Identifiers: East Germany, *Lake restoration.

The mechanism of eutrophication in inland lakes in East Germany is evaluated, and the possibilities of lake protection and technical facilities for lake restoration are pointed out. Outdoor recreation at lakes and their surroundings belongs to the non-productive sphere of the economic structure and is sometimes neglected. Therefore a new method is proposed to show the economic value of outdoor recreation.--Copyright 1976, Biological Abstracts, Inc.
W77-04657

SET SEWER RATES THAT REFLECT USE,
Missouri Univ., Columbia. Dept. of Civil Engineering.
M. M. Ghosh, and M. W. Hall.
The American City and County, Vol. 91, No. 12, p 49-50, December, 1976. 1 tab.

Descriptors: *Water rates, *Waste water treatment, *Sewerage, *Biochemical oxygen demand, Economics, Cost sharing, Capital costs, Operating costs, New Hampshire.
Identifiers: Dover(NH).

The problems of equitable distribution of water treatment costs which reflect usage were considered. The dominant question is providing reasonable means of charging industrial users for a fair share of municipal costs involved in waste water treatment. Previously, this cost was negotiated between municipalities and their largest users with taxation used to offset any differences. It is recommended that a new system involving accurate determination of the quantity and quality of influent from these customers be used to determine the load on the municipal system and costs determined from this consideration. The most common rate structures used are: Ad valorem tax, bases on dollar value of property or a levy on corporate revenue; percentage of water bill, varied from 50% to 150%; special assessment charges; volume of sewage; or volume of sewage plus surcharge for suspsended solids, oil and grease, BOD, chlorine demand or some other parameter. The practices of Dover, New Hampshire, were used for an example. Both collection and operating costs are charged to direct users. Annual revenue for maintenance and operation was proportioned on the basis of percentage-of-use. (Collins-FIRL)
W77-04663

CALIFORNIA CITIES LAUNCH $2 BILLION IN SEWERAGE JOBS.
Engineering News-Record, Vol. 197, No. 26, p 27, December, 1976.

Descriptors: *Sewerage, *Cities, *Waste water treatment, Sludge treatment, Ultimate disposal, Landfills, Treatment facilities, Pumping stations, Sludge disposal, Storm water, California.
Identifiers: San Francisco(Calif), Los Angeles(Calif).

The cities of San Francisco and Los Angeles, California, have embarked on programs to upgrade their waste water handling capabilities. San Francisco plans a $1.5 billion program which includes building collector sewers, storm water storage, a 114-mgd pumping station, and the consolidation of outfalls on the city's east side. The project is expected to be completed in twelve years. The $500 million Los Angeles project involves improvements to the Hyperion plant at Playa del Rey, its major treatment facility, to upgrade it to secondary treatment in five years. Upon completion, the plant will handle its own 160 tons per day of sludge, as well as sludge from another small waste water plant and two reclamation plants. The sludge will be disposed in sanitary landfills. Ocean discharge will be discontinued by the early 1980s. (Collins-FIRL)
W77-04665

NO SEWERS--NO GROWTH,
E. H. Boyles.
DE Journal, Vol. 228, No. 5, p 56-59, 77, November, 1976. 6 tab.

Descriptors: *Water conservation, Domestic water, Domestic wastes, Treatment facilities, Plumbing.
Identifiers: Sewer moratorium, Housing industry.

The spread and impact of sewer moratoriums as a means of restricting community growth was investigated. One major effect of this program is an adverse effect on the recovery of the American housing industry. One plumbing industry spokesman suggested that moratoriums result in housing shortages; unemployment in the construction industry; depressed business for builders, subcontractors, and their suppliers; and contribute to rising costs. Sewer moratoriums result when a sanitary district or municipality outgrows its sewerage system or cannot maintain established treatment standards. The moratorium usually involves a combination of the following factors: a freeze on new sewer authorizations, a freeze on new sewer connections, a freeze on new building permits or a class of building permits, a freeze on subdivision requests or re-zoning and zoning to higher than developed densities, and a slowing down or quota system for any or all of the above. Suggested solutions consisted of developing untapped water sources, building additional sewage treatment facilities, or instituting an area-wide water conservation program. One facet of the latter category is water saving fixtures and fittings. Various items, suggested by the plumbing industry, were evaluated. (Collins-FIRL)
W77-04666

DEVELOPMENTS AT WATER RESEARCH CENTRE.
For primary bibliographic entry see Field 5D.
W77-04688

IMPACT OF STORMWATER RUNOFF ON RECEIVING WATER QUALITY,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-04734

INTRODUCTION TO URBAN STORMWATER RUNOFF MODELS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5B.
W77-04735

SIMPLIFIED METHODS OF COMPUTING THE QUANTITY OF URBAN RUNOFF,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 2E.
W77-04736

ENVIRONMENTAL CONCERNS OF (SWEDISH) WOOD-PROCESSING INDUSTRIES,
National Swedish Environment Protection Board, Stockholm.
N. Jirvall.
In: Timber Bulletin for Europe, Vol 28, Supplement 4, Papers presented to the Symposium on Forests and Wood: their role in the Environment, Interlaken, September, 1975, Part II, p 215-231 (English), p 232-249 (French), p 250-271 (Russian), February, 1976. 6 fig.

Descriptors: *Air pollution, *Water pollution, *Solid wastes, Pulp and paper industry, Saw mills, Europe, Legislation, *Regulation, Water conservation, *Water pollution control, Water pollution sources, Wastes, Industrial wastes, *Water pollution treatment, *Capital costs, Economics, Foreign countries.
Identifiers: *Wood-processing industry, *Sweden, Particle board, Hardboard, Insulation board.

Discharges of solids wastes (bark, etc.) high-BOD effluents, and atmospheric emissions by pulp-paper, hardboard, particle board, insulation board, and sawmill enterprises in Sweden are discussed. Wood-processing industries in Sweden are among the predominant sources of environmental disruption. Legislative-regulatory approaches taken to limit water consumption and pollution have emphasized internal measures over external treatment processes. Uniform emission standards are impractical, owing to widely varying local conditions; rather, the application of best available antipollution technologies is stresed. Costs of environmental control may be 10-15% of total capital investment for new mills, but may often be less than the impacts of increased energy, labor, or raw material costs. (Brown-IPC)
W77-04828

ENVIRONMENTAL CONCERNS OF WOOD-PROCESSING INDUSTRIES (IN AUSTRIA),
Bundeskammer der Gewerblichen Wirtschaft, Vienna (Austria).
N. Knoll.
In: Timber Bulletin for Europe, Vol 28, Supplement 4, Papers presented to the Symposium on Forests and Wood: their role in the Environment, Interlaken, September, 1975, Part II, p 272-280, United Nations, Geneva, Switzerland, February, 1976. 2 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, Water pollution sources, Wastes, Waste water treatment, Waste treatment, Capital costs, Economics, Sulfite liquors, *Pulp wastes, Air pollution, Filters, Fuels, Recycling, Research and development, Governments, Evaporation, Incineration, Yeasts.
Identifiers: *Austria, Chemical recovery, Closed systems, Waste paper, Noise, Spent sulfite liquor.

Purification of pulp, paper, and groundwood mill effluents in Austria may require a capital investment of about 4,500 million Austrian Schillings through 1978. The most effective water pollution prevention method is to collect, evaporate, and burn spent pulping liquors and recycle the recovered chemicals. In the sulfite pulp industry, the use of Mg, Na, or ammonium bases is a prerequisite to the regeneration of cooking liquors. Air pollution by gaseous or solid dust emissions is best controlled by dry separators and air filters, in conjunction with the use of low-sulfur fuels. Other environmental protection principles, such as waste paper recycling, closed water circuits, and yeast production on spent sulfite liquor, are also mentioned, along with the need for noise control and government-supported research and development work. (Brown-IPC)
W77-04829

THE MANAGEMENT OF URBAN COASTAL RESOURCES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 6B.
W77-04845

LAKE ONTARIO ATLAS: LAND USE,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W77-04846

A SIMPLE DIAGNOSTIC MODEL TO DETERMINE THE FEASIBILITY OF SALINITY CONTROL OF EURASIAN WATERMILFOIL,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
E. Knowles.
Sea Grant College Program Publication No. UNC-SG-76-07, August 1976. 25 p, 2 fig, 1 ref. SG-04-6-158-44054.

Descriptors: *North Carolina, *Aquatic weed control, *Aquatic plants, *Feasibility studies, Salinity, Freshwater, Water quality, Anaerobic conditions, *Herbicides, Model studies, Harvesting of algae, Pollution abatement, *Water pollution control.
Identifiers: *Eurasian watermilfoil, *Salinity control.

There are several methods proposed for the control of Eurasian Watermilfoil, including the application of herbicides, the use of mechanical harvesting and the increase of salinity of the water body. It is with this last method that this paper is concerned. The level of salinity required to use this method as a control mechanism is probably about one-half sea strength. The diagnostic models developed are simple and limited in application by some of their assumptions, but do provide valuable information in evaluating the method of salinity control. It was apparent from this analysis that cutting an inlet to control the salinity level of a basin may be unrealistic if keeping the level at a desired point is important. If, on the other hand, the decision is made to permanently change the basin from brackish to saltwater, the inlet may be the best salinity control alternative. Pumping is the most reliable 'controlled' way to raise and then maintain the salinity level, but as can be seen by the cost analysis, the initial costs are very high. (NOAA)
W77-04848

RECLAMATION OF WATER FROM WASTES IN SOUTHERN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5D.
W77-04850

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART C, LITTLE ARKANSAS RIVER BASIN,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6B.
W77-04851

THE PUBLIC TRUST DOCTRINE: A VIABLE APPROACH TO INTERNATIONAL ENVIRONMENTAL PROTECTION,
Denver Univ., Colo. International Legal Studies Program.
For primary bibliographic entry see Field 6E.
W77-04853

STATE OF DELAWARE NEW CASTLE COUNTY RIVER BASIN, WATER QUALITY MANAGEMENT PLAN.
Delaware State Dept. of Natural Resources and Environmental Control, Dover.
Div. of Environmental Control, Water Resources Section. September 1975. 461 p. 29 fig., 39 tab., 21 ref., 6 append. EPA 1-033100750.

Descriptors: *Comprehensive planning, *Delaware, *Water quality, *River basins, Basins, Watershed management, Federal Water Pollution Control Act, Water resources development, Water management(Applied), Multiple-purpose projects, Planning, State jurisdiction, River basin development.
Identifiers: *New Castle County River Basin(Del), FWPCA 1972 Amendments.

One of three water quality management plans for river basins in Delaware, the plan describes all state and sub-state actions underway or projected to meet requirements of Section 303(e) of the Federal Water Pollution Control Act Amendments of 1972. The document describes a five year comprehensive state plan to identify the basin's water quality problems and posit timely remedial cost-effective programs to resolve them. Included as plan elements are: (1) An overview describing the county, its meteorological characteristics, its water resources and subcounty variations; (2) the goals and objectives for water quality planning as established by the federal government and the state; (3) areawide waste treatment management (208 planning); (4) a background description of the basin, including land forms, growth forces, planning determinants, land use and future growth potential; (5) natural resource management responsibilities for point source pollution; (6) sewer and wastewater programs; (7) non-point pollution sources; (8) strategies for plan implementation; (9) individual analyses for eight sub-basin river segments. (Harris-Wisconsin)
W77-04856

STATE OF DELAWARE SUSSEX COUNTY RIVER BASIN, WATER QUALITY MANAGEMENT PLAN.
Delaware State Dept. of Natural Resources and Environmental Control, Dover.
Div of Environmental Control, Water Resources Section, December 1975. 359 p. 21 fig., 31 tab., 14 ref., 6 append.

Descriptors: *Comprehensive planning, *Delaware, *Water quality, *River basins, Basins, Watershed management, Federal Water Pollution Control Act, Water resources development, Water management(Applied), Multiple-purpose projects, Planning, State jurisdiction, River basin development.
Identifiers: *Sussex County River Basin(Del), FWPCA 1972 Amendments.

One of three water quality management plans for river basins in Delaware, the plan describes all state and sub-state actions underway or projected to meet requirements of Section 303(e) of the Federal Water Pollution Control Act Amendments of 1972. The document describes a five year comprehensive state plan to identify the basin's water quality problems and posit timely remedial cost-effective programs to resolve them. Included as plan elements are: (1) An overview describing the county, its meteorological characteristics, its water resources and subcounty variations; (2) the goals and objectives for water quality planning as established by the federal government, and the state; (3) areawide waste treatment management (208 planning); (4) a background description of the basin, including land forms, growth forces, planning determinants, land use and future growth potential; (5) natural resource management responsibilities for point source pollution; (6) sewer and wastewater programs; (7) non-point pollution sources; (8) strategies for plan implementation; (9) individual analyses for seven sub-basin river segments. (Harris-Wisconsin)
W77-04857

ENVIRONMENTAL QUALITY STANDARDS UNDER CONDITIONS OF UNCERTAINTY,
Guelph Univ. (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-04858

WASTED HEAT AND AQUATIC ECOSYSTEMS,
Atkins Research and Development,Epsom (England).
For primary bibliographic entry see Field 5C.
W77-04869

CONNECTICUT RIVER BASIN PROGRAM. PART III, PHASE I. WATER QUALITY RECONNAISSANCE FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass., Region I.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 115, Price codes: A06 in paper copy, A01 in microfiche. Final Report to New England River Basin Commission, Boston, Mass., March 1975. 271 p. 42 fig, 13 tab, 156 ref, 2 append. CRS-NERBC-EPA 1.6B (1.2).

Descriptors: *Stream flow, *Water quality, *Connecticut River, *New England, Low flow, Floods, Erosion, Silting, Nutrients, Nitrogen, Phosphates, River basins, Impoundments, Land use, Suspended solids, Coliforms, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Temperature, Surveys, Tributaries, Flood control.
Identifiers: *Connecticut River Basin Commission, Nutrient loading, Westfield River(Mass), Deerfield River(Mass), Ammonoosuc River(NH), White River(Vt), Passumpsic River(Vt), Whetstone Brook(Vt).

Factors primarily responsible for water quality in the Connecticut River, including stream flow variations, and nutrient, sediment and silt loss, are determined, based on available data derived from such sources as EPA, USGS, and the Corps of Engineers. Correlations between flow and 12 parameters indicated that only 10% to 25% of parameter variation can be attributed to streamflow. Daily nutrient loads varied from 1,300-8,000 lbs/day for ammonia nitrogen and 9,000-13,000 lbs/day for phosphates at Northfield, Massachusetts, to 13,000-33,000 lbs/day and 11,000-30,000 lbs/day respectively at Enfield, Connecticut, just below the Sprinfgield metropolitan area. Estimated silt loss ranged from .75 million-5 million lbs/day. Physical-chemical changes in water quality which occured as a result of impoundments and land uses are also discussed. A bibliography was developed on the impoundment issue. In addition, a water quality reconnaissance of six selected tributaries, the Westfield River, the Deerfield River, Whetstone Brook, the White River, the Ammonoosue River, and the Passumpsic River, was performed. Parameters such as dissolved oxygen, alkalinity, BOD, and coliform counts are reported. (Luedtke-Wisconsin)
W77-04871

IMPROVING THE SANITARY PROTECTION OF GROUND WATER IN SEVERELY FOLDED, FRACTURED, AND CREVICED LIMESTONE,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5B.
W77-04890

SYNOPTIC SURVEY OF HYPOLIMNETIC AERATION,
Limnological Associates, Ojai, Calif.
A. W. Fast, and M. W. Lorenzen.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE6, Proceedings Paper 12628, p 1161-1173, December 1976. 15 fig, 33 ref, 1 append.

Descriptors: *Lakes, *Reservoirs, *Hypolimnion, *Aeration, *Thermal stratification, Stratification, Thermocline, Temperature, Destratification, Mixing, Oxygenation, Dissolved oxygen.
Identifiers: *Air injection, *Mechanical agitation, *Oxygen injection, *Oxygen depletion, Partial air lift system, Full air lift system.

Hypolimnetic aeration/oxygenation is a means of oxygenating hypolimnetic waters without disrupting thermal stratification in a lake or reservoir. Seventeen different hypolimnetic aerator/oxygenator designs were presented and analyzed. They were categorized as mechanical

agitation systems, pure oxygen injection systems, and air injection systems. Air injection systems can be further subdivided into full air lift designs, partial air lift designs, and downflow air injection. Of all the systems, the full air lift is probably the most efficient in terms of energy consumed to dissolve a given amount of oxygen. None are in widespread usage. (See also W77-04900) (Bender-ISWS)
W77-04899

COMPARATIVE STUDY WITH COSTS OF HYPOLIMNETIC AERATION,
Limnological Associates, Ojai, Calif.
A. W. Fast, M. W. Lorenzen, and J. H. Glenn.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE6, Proceedings Paper 12629, p 1175-1187, December 1976. 7 fig, 1 tab, 37 ref, 1 append.

Descriptors: *Lakes, *Reservoirs, *Aeration, *Dissolved oxygen, *Hypolimnion, Oxygenation, Oxygen, Stratification, Thermal stratification, Temperature, Thermocline, Destratification, Mixing, Water pollution treatment, Pollution abatement.
Identifiers: *Oxygen depletion, *Liquid oxygen system, *Partial air lift system, *Full air lift system, *San Vicente Reservoir(Calif).

Hypolimnetic aeration/oxygenation is a means of oxygenating hypolimnetic waters of a lake or reservoir without disruption of thermal stratification. The process differs from destratification, in which the objectives are reduction of thermal stratification and oxygenation of bottom waters. Hypolimnetic aeration/oxygenation improves water quality for domestic and industrial supply, creates suitable habitat for yearlong survival of coldwater fish, satisfies downstream water release standards for oxygen and temperature, and otherwise benefits the environment. Methods of hypolimnetic aeration/oxygenation which use pure oxygen, a partial air lift pump, and a full air lift pump were described and analyzed. Comparison of cost estimates for these systems at San Vicente Reservoir, California, revealed that the full air lift design is more efficient and less costly to operate. However, the requirements of a prospective aeration site may favor the unique properties of any one of the systems. (See also W77-04899) (Bender-ISWS)
W77-04900

ENVIRONMENTAL LAW--WATER POLLUTION--EPA ADMINISTRATOR IS EMPOWERED TO PROMULGATE EFFLUENT LIMITATIONS--AMERICAN IRON AND STEEL V EPA, 526 F2D 1027 (3D CIR 1975),
D. E. Goroff.
Suffolk University Law Review, Vol 10, No 4, p 1225-47, Summer 1976.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, *Industrial wastes, *Regulation, Legal aspects, Discharge(Water), Effluents, Wastes, Pollutants, Permits, Water pollution, Water pollution sources, Legislation, Standards, Water pollution control, Judicial decisions.
Identifiers: *FWPCA Amendments of 1972, *Effluent limitations.

This note discusses the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, in light of the decision in American Iron and Steel Institute v. EPA. The Third Circuit Court of Appeals determined that the FWPCA Amendments of 1972 authorize the Administrator of the Environmental Protection Agency (EPA) to promulgate effluent limitations regulating the discharge of water pollutants from existing industrial point sources. The decision came in response to a petition filed by the American Iron and Steel Institute, contending that the EPA lacked statutory authority to issue express limitations regulating effluent discharges. Effluent limitation is primarily concerned with regulating the quality and quantity of pollutant discharge from a given source or category of sources. The FWPCA distinguishes between effluent limitations and water quality standards. The author reviews provisions of FWPCA so that the impact of case is better understood. He discusses the ambiguous nature of the FWPCA, and the difficulties the judiciary has had with finding indicators of Congressional intent with regard to EPA's limitation--issuing authority. The distinctions between EPA's promulgating authority and the permit issuing process are also discussed. (Morse-Florida)
W77-04903

RESIDUAL WASTE: MODEL STATE LEGISLATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
D. Macdonald, J. M. Cole, W. F. Dwyer, and D. A. O'Leary
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 031, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-440/9-76-004, March 1976. 142 p, 4 append. 68-01-3550.

Descriptors: *Environmental sanitation, *Residual soils, *Planning, *Legislation, *Sludge disposal, Disposal, Waste disposal, Municipal wastes, Settling basins, Solid wastes, Management, Project planning, Industrial wastes, Waste water disposal, Federal government, Administrative agencies, Regulations, Governmental interrelations, Legislation, State governments, Local governments, Permits.
Identifiers: *Regional planning, *Urban planning, *Federal Water Pollution Control Act Amendments of 1972, Hazardous substances, Licenses.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 provide for a waste treatment management process for the disposition of all residual waste. Consistent with this, the Environmental Protection Agency (EPA) has proposed Model State Legislation for residual waste. The research methodology consisted of singling out frequently mentioned problems concerning residual waste disposal and then locating specific existing state legislation aimed at remedying the problems. The compilation of each problem and solution became the Model legislation. Areas in which legislation is needed include: programs of state and local incentives for resource conservation; specific provisions for permitting the use of sludge on land; wider recognition of the benefits to the states from comprehensive control of hazardous wastes. The second and third propositions are treated extensively in the model legislation. Specific problems addressed are: the relationship between statutes, ordinances and regulations; choosing between new law and regulation; the appropriate level at which laws and regulations should be enacted and enforced; vagueness and overbreadth in legislative definitions; providing guidelines under which legislatively delegated authority is to be used; establishing clear permit requirements; protecting each citizen's right to notice, hearings and judicial review; and provisions for injunctions to obtain speedy relief from unsanitary disposal operations. (Moorhouse-Florida)
W77-04905

THE TRANS-ALASKA PIPELINE AND STRICT LIABILITY FOR OIL POLLUTION DAMAGE,
Washington Univ., St. Louis, Mo. School of Law.
A. G. Stone.
Urban Law Annual, Vol 9, p 179-201 (1975). 107 ref.

Descriptors: *Alaska, *Oil pollution, *Oil industry, *Pipelines, *Piping systems(Mechanical), Oil, Oil fields, Oil spills, Oil wastes, Pipe foundations, Engineering structures, Hydraulic structures, Hydraulic conduits, Transportation, Mechanical engineering, Water pollution, Pollutants, Pollution abatement.
Identifiers: *Absolute liability.

In November, 1973, Congress enacted the Trans-Alaska Pipeline Authorization Act permitting construction of the pipeline without judicial resolution of the environmental challenges raised. This article examines the pipeline's development and potential environmental effects, the Act's inclusion of strict liability for damage caused by oil pollution and a proposed general adoption of strict liability for all oil transportation and storage. The environmental problems raised include damage to the permafrost, the earthquake risk and the marine impact of oil spills in arctic waters resulting in bird and fish destruction. Owners of the pipeline right-of-way are strictly liable for damages incurred along the pipeline, and owners and operators of oil tankers carrying oil transported by the pipeline are strictly liable for damages to all injured parties resulting from oil spillage pollution. The author suggests that the Act sets the stage for federal statutes imposing strict liability for damages resulting from all oil transport, thereby classifying oil transport as an ultrahazardous activity and no longer relying upon outdated common law remedies. (Welch-Florida)
W77-04907

WATER POLLUTION CONTROL REFORM IN IOWA: THE DEPARTMENT OF ENVIRONMENTAL QUALITY ACT OF 1972,
F. M. Baker.
Urban Law Annual, Vol 8, p 241-251 (1974). 71 ref.

Descriptors: *Iowa, *Water quality control, *Legislation, *Water quality standards, *Administrative agencies, Administrative decisions, Water resources development, Water conservation, Water law, Water policy, Water pollution control, Regulation, Administration, Legal aspects, State jurisdiction, Pollution abatement, State governments.
Identifiers: *Administrative regulations.

This article examines recent reorganization of administration and enforcement of water pollution control in Iowa. Although the control provisions of the Department of Environmental Quality Act of 1972 are substantially identical to earlier legislation, the new Act provides for extensive structural reorganization of the control program. The Act creates a separate parent agency to administer the pollution control programs in areas of chemical technology, solid waste disposal and water pollution control. Attempts to provide coordination among responsible agencies resulted in valuable professional input to lay commissions. The Act also provides administrative structural modifications in order to balance any threat of political influence. The Act preserves the traditional informal proceedings, yet it provides procedural safeguards for alleged polluters. A singular feature of the Iowa law is the requirement that the Water Quality Commission engage in informal negotiations as the first step in the enforcement process. The major weakness of the pollution control procedure for compelling compliance with regulations is its requirement of free litigation of the reasonableness and validity of an order issued to force compliance. Recent Iowa Supreme Court decisions have favored the Act by requiring proper enforcement of the Act in the area of administrative ordered improvements. (Welch-Florida)
W77-04908

HOUSE OVERSIGHT HEARINGS: BEARING THE LAW'S DELAY (1972 AMENDMENTS TO FEDERAL WATER POLLUTION CONTROL ACT),
J. T. Sliter.
Journal Water Pollution Control Federation, Vol. 46, No. 3, p. 424-28, March 1974. 2 photo.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Administrative agencies, *Water quality standards, Administrative decisions, Federal government, State governments, Project benefits, Project post-evaluation, Management, Water policy, Cost repayment, Cost analysis.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Administrative regulations.

The House of Representatives held oversight hearings in February, 1974, to examine the effectiveness of the 1972 Amendments to the Federal Water Pollution Control Act. At these hearings, heavy criticism of the program and its administration was levied by state officials. The Environmental Protection Agency's (EPA) management of the construction grant program was criticized for its excessive paperwork, inadequate funding and administrative confusion, much of which arose out the maze of incomplete and changing guidelines formulated by EPA. The lack of flexibility of the secondary treatment requirements was alleged by state officials to have led obsolesence of many recently constructed waste treatment plants. The EPA denied that there had been any intentional slow down of construction grant funds but admitted that major errors in administration had occurred. The EPA contended that newly adopted regulations will be more flexible and should eliminate some of the paperwork formerly required to be completed by state and local governmental agencies. Most substantive discussion of possible legislative modifications to the Act was curtailed by EPA's predictions of future efficient construction grant program operation. (Welch-Florida)
W77-04913

MARITIME LAW: TO FISH OR CUT BAIT.
For primary bibliographic entry see Field 6E.
W77-04917

TIME BOMB IN THE MEDITERRANEAN,
J. Cousteau.
Saturday Review, Vol 3, p 10-11, April 3, 1976. 2 p.

Descriptors: *Ships, *Foreign countries, *Hazards, *International law, *Chemical wastes, *Lead, Oceans, Foreign countries, Accidents, Industrial wastes, Water pollution sources, Chemicals, Pollutants, Toxicity, Water pollution effects, Law of the sea.
Identifiers: *Mediterranean Sea.

In 1974 the Cavtat, a Yugoslavian freighter, sank at the entrance to the Adriatic Sea. It was loaded with 600,000 pounds of a poisonous and combustible cargo of lead compounds. Scientists feared then, and still fear, that swimmers and those on shore may be subject to extremely poisonous wastes, if leakage occurs. Italian authorities claimed that the accident was in international waters and therfore was not their responsibility. The Yugoslav ship owners said that the cargo was only a potential pollutant, not an interference to navigation, and therefore, was not in violation of international law. Since that time, the two countries have sent a research ship to explore the wreck and decide on the feasibility of raising the cargo. While these countries argue and stall, the containers that hold the lead compounds are rusting away. Because the chemicals contained can cause convulsion, insanity, coma and death, it is imperative that Yugoslavia and Italy agree to remove the large and poisonous cargo. (Frank-Florida)
W77-04919

TOWARD A NATIONAL OCEAN POLICY: 1976 AND BEYOND,
Johns Hopkins Univ., Ocean Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-04920

JURISDICTION AND GROUNDS FOR DENIAL BY STATE AND FEDERAL AGENCIES OF DREDGE AND FILL OPERATIONS,
Florida Univ., Gainesville. School of Law.
R. J. Karow.
Available from Eastern Water Law Center, University of Florida, Gainesville, Fl. 32611, $1.25. (Spring, 1976). 23p.

Descriptors: *Navigable waters, *Florida, *Dredging, *Environmental effects, *Permits, Jurisdiction, Boundaries(Property), Submerged land, Ecology, Biology, High water mark, Tidal waters, Water pollution, Administrative agencies, Hydrographic, Conservation, Federal government, State governments, Judicial decisions, Legal aspects.
Identifiers: National Environmental Policy Act.

Prospective developers actually must obtain a minimum of three permits in Florida to conduct dredge and fill operations. The permits are issued by state and federal agencies. The determination of jurisdiction includes both a determination that waters are in fact navigable and a determination of the physical boundary of navigable waters by reference to the high water mark. Until recently the sole ground for denial of a dredge and fill permit was the 'obstruction-to-navigation test', but the state now includes ecological grounds for denial. Prospective developers must apply for a permit to the Department of Pollution Control, which considers the entire environmental effect of such a develoment. Developers must also apply for a permit from the Corps of Engineers. In a recent federal case the court extended the regulatory power of the federal government to intertidal wetlands. There is now a requirement that environmental impact be considered in the determination of whether to issue a permit. The ecological impact of a proposed dredge and fill operation appears to be even more important than obstructions to navigation. (Martin-Florida)
W77-04923

EFFLUENT GUIDELINES AND STANDARDS: PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 34, p. 7662-84, February 19, 1976.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Effluents, *Water quality standards, Industrial wastes, Administrative agencies, Regulation, Standards, Waste disposal, Bleaching wastes, Organic wastes, Sulfite liquors, *Water pollution control, Water quality control, Water quality, Water pollution, Pollutants, Biochemical oxygen demand.
Identifiers: *Administrative regulations.

The Environmental Protection Agency has promulgated interim final rules establishing effluent limitations and guidelines for the pulp, paper and papberboard point source category. Subcategories included within this category are dissolving kraft, market bleacked kraft, BCT bleached kraft, fine bleached kraft, papergrade sulfite, low alpha dissolving sulfite pulp, groundwood-chemi-mechanical, groundwood-thermomechanical, groundwood-CMN papers, groundwood-fine papers, soda, drink, NI fine papers, NI tissue papers, NI tissue (FWP), high alpha dissolving sulfite pulp, and papergrade sulfite market pulp. Effluent characteristics for which limitations are established are BOD5, TSS, and pH. The limitations are to be achieved by application of the best practicable control technology currently available. Limitations are also specified for the discharge of pollutants arising from the use of logs in wet woodyard operations. Capehart-Florida)
W77-04925

PROTECTION OF THE ENVIRONMENT: PAINT FORMULATING POINT SOURCE CATEGORY: PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No. 145, p 31729-30, July 28, 1975.

Descriptors: *Federal Water Pollution Control Act, *Paints, *Waste water treatment, *Water pollution sources, *Standards, Administrative agencies, Regulation, Federal government, Water pollution, Pollutants, Effluents, Water quality, Water quality control, Water quality standards, Treatment facilities, Water pollution treatment.
Identifiers: *FWPCA Amendments of 1972, *Administrative regulations.

The Environmental Protection Agency has proposed a regulation amending the pretreatment standards for existing sources in the paint formulating point source category. The regulation allows no dischare of process water pollutants to a publicly owned treatment works by a source within the oil-base solvent wash paint subcategory. (Capeheart-Florida)
W77-04926

EFFLUENT GUIDELINES AND STANDARDS: PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 97, p. 21731-32, May 19, 1975.

Descriptors: *Effluents, *Legislation, *Federal Water Pollution Control Act, *Plastics, Federal government, Legal aspects, Legal review, Government, Laws, Administration, Regulation, Programs, Standards, Classification, Pollution control.
Identifiers: Synthetics, Point source(Pollution).

The Environmental Protection Agency has announced a change in the final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the Plastics and Synthetics Point Source Category of the Federal Water Pollution Control Act. The reason for the change is: (1) to correct a minor error in the new source performance standard for the product High Density Polyethylene polyform process in the polyethylene subcategory, (2) to provide for reconsideration of the acrylics subcategory limitations and new source performance standards and for suspension of their applicability during the reconsideration period, and (3) to withdraw COD as a limitation parameter for 1977. Detailed reasons for the change are discussed. (Hadoulias-Florida)
W77-04928

FMC V TRAIN (VALIDITY OF EPA GUIDELINES FOR PLASTICS AND SYNTHETICS),
For primary bibliographic entry see Field 6E.
W77-04929

TIDAL WATER MOVEMENTS,
Dalhouse Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-04938

APPARATUS AND METHOD OF REMOVING DEBRIS FLOATING ON A BODY OF WATER,
Chevron Research Co., San Francisco, Calif. (Assignee).
D. E. Wilson.
U.S. Patent No. 3,983,034, 7 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 950, No 4, p 1550, September 28, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, *Skimming, *Separation techniques, Floating, Buoyancy, Floats, Pontoons.
Identifiers: Debris.

A skimmer for removal of liquid and debris, such as skimming oil spills from water, comprises three pontoons, one located in each of the corners of a triangle made up of interconnecting structural members floating on a body of water. The corner pontoons are adjustable permitting the skimmer to move vertically up or down as a unit in the water to adapt to wave height. At the base of the triangle the skimmer mouth slopes upward towards a sump. The two pontoons on each side of the sloped mouth have a clamp which guides the oil into the skimmer. The function of the mouth is to skim off approximately two inches of the water surface. The sloped mouth terminates at an impregnable deflector centrally located between two screens that serve as a wave quieting assembly as well as a separator of debris floating on the water. The skimmed water is then directed through the debris screens into a quieting area. Once in this area, the oil slick flows over a self-adjustable weir into a sump. The weir has a float that modifies the weir elevation with changes of liquid level in the sump. The skimmed liquid is pumped to a storage tank. (Sinha-OEIS)
W77-04953

APPARATUS FOR CONTROLLING MARINE FOULING OF SALT WATER COOLANT HEAT EXCHANGERS, PIPING SYSTEMS, AND THE LIKE,
General Dynamics Corp., Groton, Conn. (Assignee).
For primary bibliographic entry see Field 8G.
W77-04956

IMPROVED WASTE-TREATMENT SYSTEMS DESIGN BASED ON THE NATURAL THERMAL ENVIRONMENT,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W77-05004

NON-POINT SOURCES OF WATER POLLUTION.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-05007

SURFACE-WATER QUALITY MANAGEMENT MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
D. P. Loucks.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 219-252 (Chapter 6), McGraw-Hill, New York, N.Y., 1976. 1 fig, 27 ref. OWRT C-1640(No. 3151)(8).

Descriptors: *Water pollution control, *Surface waters, *Water policy, *Dissolved oxygen, *Decision making, *Optimization, *Mathematical models, *Alternative planning, Water quality, Management, Analytical techniques, Evaluation, Waste water treatment, Waste water disposal, Economic efficiency, Damages, Standards, Constraints, Rivers, Lakes, Estuaries, Artificial aeration, Flow augmentation, Equations, Systems analysis.
Identifiers: Waste water collection, Public policy, Environmental quality, Waste water transport, Thermal loading, Reduction models, Minimization.

Examined is a variety of deterministic models for the preliminary selection of pollution-control policies for surface waters. This review considers only the general framework of some of the recently proposed optimization models for defining and evaluating combinations of waste water reduction and treatment, artificial aeration, flow augmentation, and bypass piping alternatives for the management of dissolved oxygen concentrations in regional surface water systems. Emphasis is on problem definition and model development. Optimization models are best used to reduce the number of alternatives that need to be simulated in search of a satisfactory solution. Outlined are some of the preliminary screening models that have been proposed and used in conjunction with more detailed aquatic ecosystem simulation models to assist in the decision making process. The main purpose of most regional water quality models is to examine alternatives that will internalize and reduce both the private costs and public damages resulting from water pollution. (See also W77-05008) (Bell-Cornell)
W77-05014

ECOLOGIC MODELS,
Manhattan College, Bronx, N.Y. Environmental Engineering and Science Program.
For primary bibliographic entry see Field 5B.
W77-05016

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 5-6, 1974,
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 6B.
W77-05029

OCEAN DUMPING--PART 2.
For primary bibliographic entry see Field 5E.
W77-05037

MODEL WATER POLLUTION STATUTE,
Florida Univ., Gainesville. School of Law.
D. Lee, and P. Smith.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611. $1.80. 1968. 35 p.

Descriptors: *Florida, *Legislation, *Administration, *Water quality control, *Pollution abatement, Governments, Legal aspects, Planning, Regulation, Water law, Nonstructural alternatives, Project planning, Model studies, Research and development, Theoretical analysis, Evaluation, Governmental interrelations, Administrative agencies.

Proposed herein is a water pollution control statute designed to solve some of the existing and predicted water pollution problems in Florida. The model legislation provides for a separate governmental agency to deal with the statute and the complex problems relating to water pollution. This Water Pollution Control Board, consisting of various governmental, industrial and citizen representative, has been allocated various extensive powers and duties. The Board, through its Regional Representative, may issue permits for discharge of wastes into water bodies. The legislation also provides for incentives to increase pollution abatement. Coordination of all types of water resource management at the regional level guided by policy decisions and overall planning at the state level is the most practical way to accomplish the goal of water quality control. Administrative responsibility for water pollution control should be separated from all other aspects of water law and administration. While an integrated water use program at the state level should be administered by regional pollution representatives. (Welch-Florida)
W77-05042

THE BALANCING OF CONVENIENCE DOCTRINE ESPECIALLY AS APPLIED TO WATER POLLUTION,
Florida Univ., Gainesville. School of Law.
D. T. Wilcox.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida 32611. $3.80. 1972. 76 p.

Descriptors: *Water law, *Judicial review, *Prior appropriation, *Reasonable use, *Equity, *Florida, Legal review, Legal aspects, Pollutants, Water pollution, Water policy, Water rights, Riparian rights, Law enforcement, Public rights.
Identifiers: *Nuisance(Legal aspects), *Injunctive relief.

Whether an injunction will be issued in water pollution cases is usually a matter of balancing divergent public interests. The interrelationship between these interests, however, is often quite complex, and courts must weigh carefully the harms resulting from water pollution and injunctions. Much of the present riparian law is governed by the doctrine of reasonable water use. Reasonable use is the balancing of interests; several such balancings are discussed. These include: competing commercial interests, the rights of domestic users vs. those of industrial producers, the scope of the right of a public authority to pollute in the public interest, and cases where the municipality is a defendant. Possible equitable remedies may serve justice if they are creative and fair. These include: requiring a reduction in pollution; having the polluter pay the full and future sum of the damages he is causing and then allow him to continue polluting; and the installation of proper pollution devices. As a final guide to equitable remedies, objective and subjective factors must be considered. Primary among these are health, economic value of the industry, stream use, and the defendant's ability to abate. (Frank-Florida)
W77-05046

FARMERS, FEEDLOTS AND FEDERALISM: THE IMPACT OF THE 1972 FEDERAL WATER POLLUTION AND CONTROL ACT AMENDMENTS ON AGRICULTURE,
Iowa Univ., Iowa City. Coll. of Law.
N. W. Hines.
South Dakota Law Review, Vol 19, No 3, p 540-566 (Summer 1974).

Descriptors: *Water pollution control, Agriculture, *Agricultural runoff, *Feed lots, Management, *Farm wastes, Livestock, Agricultural chemicals, Surface runoff, Pollutants, Water quality, Water quality control, Federal government, Legislation, Administrative agencies, State governments, Social aspects, Effluents, Pollutants, Pollutant identification, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act of 1972, Hazardous substances, Effluent limitations, Administrative regulations.

The Water Pollution Control Act of 1972 represents a bold change in the national strategy for combatting water pollution. No longer are ambient standards looked to, but rather the goal has become the restoring and maintaining of the chemical, physical and biological integrity of U. S. waters. To achieve this goal the target date of 1985 has been established for the total elimination of wastes from waters. Initially the major thrust of enforcement was directed at municipal and industrial polluters. Recently, however, agriculture's role in befouling the nation's waters has come to the forefront. There is now a great deal of interest in curtailing agricultural pollution. The general application of the Act to agricultural pursuits is made clear by the inclusion of 'agricultural wastes' in the definition of the basic term 'pollutant'. The downfall in agricultural enforcement comes from the overemphasis on point sources of pollution, especially feedlots. The fact is, however, that most agricultural pollution is caused by land ru-

noffs. Solutions to this problem have been deferred for future study making the Act's agricultural pollution provisions ineffective. (Moorhouse-Florida)
W77-05047

AREAWIDE PLANNING UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972: INTERGOVERNMENTAL AND LAND USE IMPLICATIONS,
M. Jungman.
Texas L Review, Vol 54, No 5, p 1047-80 (1976).

Descriptors: *Federal Water Pollution Control Act, *Land use, *Land management, *Land development, *Water quality, Water users, Waste water(Pollution), Waste water disposal, Water conservation, Planning, Natural resources, Nonstructural alternatives, Regional economics, Zoning, Water management(Applied), Comprehensive planning, Project planning, Alternate planning, Coordination, Forecasting, Governments, Legislation, Management, Water pollution, Water law, Governmental interrelations.
Identifiers: *Federal Water Pollution Control Act (FWPCA) Amendments of 1972.

This article examines the new planning responsibilities that the Federal Water Pollution Control Act Amendments of 1972 imposes upon state and metropolitan governments, the new element of federal control in local land use, and the potential legal challenges. The Act goes beyond traditional waste treatment to pollution abatement, and places a positive duty upon state and local governments to prepare comprehensive water quality control plans, and to manage both water quality and land use. The land use measures contained within the Act enhance the effectiveness of the construction grants and discharge permit program, and also help to avoid inequities inherent in the water quality program. The author examines the implications of the Act upon land use and growth management an upon intergovernmental issues, including areawide planning and management, and incentives and sanctions under the Act. The author contends that while the Act is a promising and novel approach to water pollution control, it is much too narrow in its approach to land use management on a national scale. He likewise urges the adoption of additional federal legislation to provide more comprehensive land use planning techniques. (Welch-Florida)
W77-05050

ENVIRONMENTAL LAW: FWPCAA INTERPRETED TO SUBJECT DREDGING OPERATION OF CORPS OF ENGINEERS TO STATE PERMIT PROGRAMS.
Minnesota Law Review, Vol 60, No 3, p 610-19 (1976).

Descriptors: *Minnesota, *Federal Water Pollution Control Act, *Water permits, *Dredging, *Federal jurisdiction, Water quality standards, State jurisdiction, Water quality control, Administrative decisions, Water pollution control, Water pollution sources, Federal-state water rights conflicts, Water resources, Excavation, Administrative agencies, Water law, Water control.
Identifiers: *FWPCA Amendments of 1972, *Administrative regulations.

Evaluated is a recent Minnesota case concerning the state permit program to regulate the discharge of pollutants from within Minnesota into navigable interstate waters. The program was approved by the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act Amendment of 1972. Minnesota sought a declaratory judgement that the Army Corps of Engineers must obtain a state permit for its dredging activities, and comply with the state regulations. The District Court rejected the Corps' contention that the Act had specifically granted it power to issue permits and it was therefore exempt from any state laws concerning dredging discharges. The court also held that the Act's notice provisions did not apply to a declaratory judgement writ. Although recognizing the different provisions of the Act which grant permit-issuing power to the Corps, the author supports the court's holding which limited the Corp's power to regulate dredging to those operations where an EPA-approved state program is absent. Statutory language, legislative history and policy all compel the decision that the Corps' dredging operations are subject to relevant Minnesota statutes and regulations. (Welch-Florida)
W77-05051

DEVELOPMENTS IN WATER QUALITY AND LAND USE PLANNING: PROBLEMS IN THE APPLICATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
M. B. Phillips.
Urban Law Annual, Vol 10, p 43-143 (1975).

Descriptors: *Planning, *City planning, *Grants, *Institutional constraints, *Local governments, State governments, Legislation, Coordination, Regional analysis, Government finance, Water law, Legal aspects, Projects, Permits, Water quality control, Land use, Zoning.
Identifiers: *FWPCA Amendments of 1972, Land use planning, Metropolitan sewer district, National Pollutant Discharge Elimination System(NPDES).

The Federal Water Pollution Control Act (FWPCA) Amendments of 1972 encompassed three basic program strategies: an extensive matching grant program for construction of municipal waste treatment facilities; a National Pollutant Discharge Elimination System (NPDES); and an interrelated group of three water quality planning processes that must be implemented at the state and regional levels. The related strategies of the federal construction grant program for municipal waste treatment facilities and the NPDES permit system are discussed and evaluated. The secondary effects of interceptor and treatment facility construction and the interrelationship between the water quality and land use planning processes of the FWPCA are analyzed. The future effectiveness of federal water quality planning legislation is examined through a study of the local and regional management scheme of metropolitan sewer districts in the St. Louis area. The author concludes that the traditional legal institutions available to implement FWPCA objectives in metropolitan areas are incompatible with the legal requirements of the water quality planning and construction grant programs. The legislation must be clarified if the objectives are to be satisfied. Furthermore, a complete revision and reorganization of metropolitan legal institutions is needed to facilitate regional planning and coordination. (Moorhouse-Florida).
W77-05052

SELECTED ENVIRONMENTAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
For primary bibliographic entry see Field 6E.
W77-05054

LEGISLATIVE DEVELOPMENTS--DEEP-WATER PORT ACT OF 1974,
For primary bibliographic entry see Field 6E.
W77-05056

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NPDES PROGRAM: APPLICATION OF PERMIT PROGRAM TO AGRICULTURAL ACTIVITIES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-05061

PAVING AND ROOFING MATERIALS (TARS AND ASPHALT), POINT SOURCE CATEGORY PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 143, p 31196-97, July 24, 1975.

Descriptors: *Federal Water Pollution Control Act, *Roofing materials, *Waste water treatment, *Industrial wastes, *Standards, Paving, Waste water disposal, Asphalt, Waste treatment, Administrative agencies, Regulation, Federal government, Pollutants, Effluents, Water pollution sources, Water quality, Water quality control, Treatment facilities, Oil, Biochemical oxygen demand.
Identifiers: *Administrative regulations.

The Environmental Protection Agency is proposing regulations establishing pretreatment standards for existing sources in the paving and roofing materials point source category. The subcategories included in the regulations are asphalt emulsion, asphalt concrete, and linoleum and printed asphalt felt. The pre-treatment standards apply to a source which is a user of a publicly owned treatment works and a major contributing industry. The pollutants or pollutant properties for which pretreatment standards are set are BOD5, TSS, pH, and oil and grease. (Capehart-Florida)
W77-05062

HAYES V YOUNT (APPELLATE REVIEW OF COASTAL DEVELOPMENT PERMIT),
For primary bibliographic entry see Field 6E.
W77-05064

AUTHORITY OF SECRETARY OF ARMY TO DENY DREDGING AND FILLING PERMIT FOR ECOLOGICAL REASONS UNDER SECTION 10 OF RIVERS AND HARBORS ACT OF 1899, 33 USCS SECTION 403,
For primary bibliographic entry see Field 6E.
W77-05065

ENVIRONMENTAL PROTECTION AGENCY V CALIFORNIA EX REL STATE WATER RESOURCES CONTROL BOARD (PERMIT REQUIREMENTS OF FEDERAL INSTALLATION DISCHARGING WATER POLLUTANTS),
For primary bibliographic entry see Field 6E.
W77-05067

SEWAGE DRAINS AND DISCHARGE; REFUSE DISPOSAL.
For primary bibliographic entry see Field 6E.
W77-05071

PROPOSED RESEARCH AND DEVELOPMENT PROGRAM IN FISCAL YEARS 1973 AND 1974 AT COLUMBIA AND SNAKE RIVER PROJECTS FOR NITROGEN CONTROL,
Oregon Fish Commission, Portland.
For primary bibliographic entry see Field 8A.
W77-05089

NOTES FOR MID-COLUMBIA PUD'S AND WASHINGTON DEPARTMENT OF ECOLOGY MEETING ON REVISED CONCEPTUAL PLAN FOR COMPLYING WITH SUPERSATURATED GAS STANDARD.
Mid-Columbia Public Utility Districts, Ephrata, Wash.
For primary bibliographic entry see Field 5C.
W77-05093

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE NORTH PLATTE RIVER BASIN ECONOMIC SIMULATION MODEL (A TECHNICAL REPORT AND SUPPLEMENT TO THE TECHNICAL REPORT),
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W77-04601

ENVIRONMENTAL QUALITY STANDARDS UNDER CONDITIONS OF UNCERTAINTY,
Guelph Univ. (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 6G.
W77-04858

PUBLIC PATRIMONY: AN APPRAISAL OF LEGISLATION AND COMMON LAW PROTECTING RECREATIONAL VALUES IN OREGON'S STATE-OWNED LANDS AND WATERS,
Oregon Joint Interim Committee on Environment, Agricultural and Natural Resources, Salem.
For primary bibliographic entry see Field 6E.
W77-04910

SYSTEMS APPROACH TO WATER MANAGEMENT.
Department of the Environment, Ottawa (Ontario). Environmental Systems Branch.
McGraw-Hill, Inc., New York, N.Y., 1976. 429 p. Biswas, A. K., Ed.

Descriptors: *Systems analysis, *Water management(Applied), *Mathematical models, *Decision making, *Planning, Hydrology, Constraints, Optimization, Simulation analysis, Groundwater, Surface waters, Economic efficiency, Water quality control, Social aspects, Political aspects, Water policy, Estuaries, Methodology, Equations, Linear programming.
Identifiers: *Interdisciplinary analysis, Mulitobjective planning, Cost minimization, Benefit maximization.

The application of systems analysis techniques (along with improvements in computer technologies) to improve the planning and decision-making processes and the need for interdisciplinary teamwork during such analyses are two highly important new developments in the field of water resources management. Water resources planning entails consideration of quality, quantity, and the organisms that live in and around a water body, as well as the land surrounding it. This entails participation from many disciplines, such as biology, sociology, ecology, and political science. This book examines water management problems on an interdisciplinary basis using systems analysis techniques. The first chapter reviews some fundamental aspects of water resources management and explains the concept of systems analysis with direct reference to water. The next nine chapters deal with models in specific areas: (1) rainfall-runoff; (2) generation of synthetic flow sequences; (3) groundwater; (4) surface water quantity management; (5) surface water quality management; (6) estuaries; (7) ecology; (8) economics; and (9) multiobjective water resources planning. In conclusion, the final chapter reviews in depth the role of mathematical modeling in water resources decision making. Resources management problems are becoming increasingly complex and interwoven. It is essential to use all available tools for aiding in the complicated process of policy decision making. It is better to have a crude model than not to have one at all. (See W77-05009 thru W77-05014) (Bell-Cornell)
W77-05008

SYSTEMS APPROACH TO WATER MANAGEMENT,
Department of the Environment, Ottawa (Ontario). Environmental Systems Branch.
A. K. Biswas.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 1-15 (Chapter 1), McGraw-Hill, Inc., New York, N.Y., 1976. 1 fig, 21 ref.

Descriptors: *Water resources, *Management, *Systems analysis, Comprehensive planning, Computers, Mathematics, Mathematical models, Decision making.
Identifiers: Mulitobjective planning, Programming models, Descriptive models, Social sciences modeling.

In the area of water resources management, the application of systems analysis techniques to improve the planning and decision-making processes and the need for interdisciplinary teamwork during such analyses are becoming increasingly more important. This introductory chapter reviews some of the fundamental aspects of water resources management. It discusses the reasons which have contributed to making the water-resources management process exceedingly complex; the process is expected to increase in complexity in the future. However, systems analysis is a tool which can deal effectively with this growing complexity. Relevant information on computers, mathematics, and systems analysis is given. The concept of systems analysis, with direct reference to water, is explained, as are the different categories of models--programming and descriptive. Next, the concept of multiobjective planning, including the difficulties associated with such a process, are discussed. The chapter ends with a description of the present status of social sciences modeling, which has not advanced to the same stage as models developed in the physical sciences. (See also W77-05008) (Bell-Cornell)
W77-05009

RAINFALL-RUNOFF MODELS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05010

GENERATION OF SYNTHETIC FLOW SEQUENCES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2E.
W77-05011

GROUND-WATER MODELS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W77-05012

SURFACE-WATER QUANTITY MANAGEMENT MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-05013

SURFACE-WATER QUALITY MANAGEMENT MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-05014

ESTUARIAL MODELS,
Resource Management Associates, Lafayette, Calif.
For primary bibliographic entry see Field 2L.
W77-05015

ECOLOGIC MODELS,
Manhattan College, Bronx, N.Y. Environmental Engineering and Science Program.
For primary bibliographic entry see Field 5B.
W77-05016

ECONOMIC MODELS,
Colorado Univ., Boulder. Dept. of Economics.
C. W. Howe.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 335-364 (Chapter 9), McGraw-Hill, Inc., New York, N.Y., 1976. 2 fig, 1 tab, 58 ref.

Descriptors: *Water resources, *Evaluation, *Social aspects, *Economics, *Mathematical models, Research, Water policy, Equations, Income distribution, Texas, Economic efficiency, Constraints, Decision making, Hydrologic aspects, Optimization, Projects, Systems analysis.
Identifiers: Market prices, Value measures, Public goods, Multiobjective planning, Benefit maximization, Cost minimization, Objective function.

It is difficult to know where hydrology, ecology, and water quality end and where economic modeling begins. Emphasis has been placed on issues relating to the evaluation or ranking (i.e., objective function) of alternative water developments and on recent types of modeling which extend the set of vairiables assumed to be under the policy maker's control. Economic modeling is intended to relate uses of other scarce resources (investment and operating inputs in public and private sectors) and to provide criteria for ranking different water development and management policies. It is necessary to model the physical system which influences those dimensions of welfare measured by income, its distribution among subsets of the population, the generation of employment, and physical environmental conditions. The first half of this chapter provides a concise discussion of contemporary issues in the soicial evaluation of water. The second half reviews the recent economic modelng achievements in the water resources area. The achievements are divided into seven classes, representing important model types and/or problem areas in which important advances have been made. Considered are projection models and models of agricultural development, location, and water use, to name a few. Finally, areaas which warrant substantial additional research are mentioned. (See also W77-05008) Bell-Cornell)
W77-05017

MULTIOBJECTIVE WATER-RESOURCES PLANNING,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
D. A. Haith, and D. P. Loucks.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 365-397 (Chapter 10), McGraw-Hill, Inc., New York, N.Y., 1976. 5 fig, 43 ref. OWRT C-4101 (No.3684)(1).

Descriptors: *Water resources, *Planning, *Mathematical models, *Methodology, *Political aspects, Water policy, Land resources, Feasibility, Optimization, Alternative planning, Linear programming, Decision making, Algorithms, Equations, Systems analysis.
Identifiers: *Multiobjective planning, Objective function, Target planning, Goal programming.

Planning encompasses all activities leading up to a decision among choices and continues during the post-choice stage of implementation and control. This discussion focusses primarily on the decision-among-choices part of the planning process. Emphasis is upon decision making in the public planning process, i.e., the process in which the final selection of an alernative rests with elected or appointed decision makers or policy makers who in some sense represent the public. Several assumptions are made herein: (1) public policy is

rarely implemented to satisfy only a single economic objective; (2) among the objectives that can be quantified, the parameters or criteria used to describe them need not be directly comparable; and (3) the ultimate specification of the relative importance of each objective--the selection of a policy that in turn implies the relative importance of each objective--must take place in the political process. In this review of multiobjective water resources planning, the major topics analyzed are quantification of planning objectives, models for multiobjective planning (including the problems of trade-off and political feasibility), formulation of planning alternatives, and plan selection. What is needed is a methodology that does not require explicit intervention by the political decision makers but makes use of a value judgement that has to be defined by the political decision-making process. (See also W77-05008) (Bell-Cornell)
W77-05018

MATHEMATICAL MODELING AND WATER-RESOURCES DECISION-MAKING,
Department of the Environment, Ottawa (Ontario). Environmental Systems Branch.
A. K. Biswas.
In: Systems Approach to Water Management (Ed. by Asit K. Biswas), p 398-414, (Chapter 11), McGraw-Hill Inc., New York, N.Y., 1976. 1 fig, 15 ref.

Descriptors: *Water resources, *Decision making, *Mathematical models, Planning, Management, Systems analysis, Water policy.
Identifiers: Credibility.

The role of mathematical modeling in water resources decision making and its present status are explored in depth. The primary role of a decision maker is to make correct decisions on the basis of available information and within the allowable time and resource constraints. The basic types of models used for decision making, technocratic and incremental, are discussed, and so are the common criterial of the decision-making process in a real world. Even though modeling canadd an important dimension to the decision-making process, it still lacks credibility with policy makers. The reasons for this 'credibility gap' are analyzed, and some basic rules are suggested as guidelines for realistic model development. The positive and negative aspects of modelng as used for decision making are reviewed. Appropriate remedies are suggested to improve the image of modeling in the eyes of decision makers, which will reduce the proliferation of unvalidated, untested, and useless models, much of which can be classified somewhere dilettantism and academic exercises. The world is becoming increasingly complex; major problems of resources management are becoming increasingly interwoven as well as more complex. It is essential to utilize all the available techniques to aid in the complicated process of policy decision making. Most models fail because too much concentration is placed on the technical issues and not enough on the managerial ones. It is better to have a crude model than not to have one at all. (See also W77-05008) (Bell-Cornell)
W77-05019

STATE COASTAL MANAGEMENT PROGRAMS,
South Carolina Coastal Zone Planning and Management Council, Charleston.
For primary bibliographic entry see Field 6E.
W77-05035

COASTAL ZONE MANAGEMENT: THE PROCESS OF ACHIEVING EQUILIBRIUM,
Georgia State Office of Planning and Budget, Atlanta. Planning Div.
For primary bibliographic entry see Field 6E.
W77-05036

6B. Evaluation Process

THE NORTH PLATTE RIVER BASIN ECONOMIC SIMULATION MODEL (A TECHNICAL REPORT AND SUPPLEMENT TO THE TECHNICAL REPORT),
Wyoming Univ., Laramie. Water Resources Research Inst.
J. F. Carlson, G. F. Doll, C. Phillips, J. Lofgren, and J. W. Brock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 828, Price codes: A11 in paper copy, A01 in microfiche. Completion report to OWRT, August 1976. Technical Report and Supplement. 211 p, 79 tab. OWRT A-017-WYO(1), 14-31-0001-4051, 5051.

Descriptors: *Computer models, *Simulation analysis, *Economic impact, Economic growth, Employment, *Wyoming, River basins, Model studies, Human population, Water demand, Income, Agriculture, Computer programs.
Identifiers: *Economic simulation model, *North Platte River Basin(Wyo), Housing.

This two-volume study reports the development and application of a continuous-growth economic simulation model to a discrete-growth economy. The model developed is an adaptation of the TVA Regional Simulation Model to Wyoming's North Platte River Basin, which includes eight Wyoming counties. The model is employment-based and simulates economic activity in six sectors: population, employment, water demand, income, agriculture, and housing. All major economic variables contained in the model are expressed in terms of functions relating dependent and independent variables, thus allowing virtually unlimited experimentation with various functional forms. The information in the supplement contains three parts. Part I lists the variables used in the model as well as the format in which they are presented, along with short descriptions of several of the variables. Part II provides a more detailed description of many of the variables and also indicates the manner in which certain of them are related or are functions of each other. Part III is a listing of the data file as it actually appears on a computer printout.
W77-04601

A BENEFIT/COST EVALUATION OF DRINKING WATER HYGIENE PROGRAMS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Science.
For primary bibliographic entry see Field 5F.
W77-04639

THE COST OF MUNICIPAL WATER SUPPLY: A CASE STUDY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5F.
W77-04643

LIMNOLOGICAL DATA AND THEIR USE IN PRACTICAL WATER MANAGEMENT, (IN GERMAN),
Institut fuer Wasserwirtschaft, Magdeburg (East Germany).
For primary bibliographic entry see Field 5G.
W77-04657

SUMMARY, PHASE 1 - ARIZONA STATE WATER PLAN: INVENTORY OF RESOURCE AND USES.
Arizona Water Commission, Phoenix.
July, 1975, 34 p., 9 fig, 16 tab.

Descriptors: *Water resources, *Water supply, *Dependable supply, *Water utilization, *Arizona, Groundwater, Groundwater availability, Subsurface waters, Surface waters, Surface water availability, Water quality, Waste water(Pollution), Water users, Competing uses, Irrigation, Industrial water, Water policy, Water consumption(Except consumptive use), Water law, Water loss, Water demand.

The purpose is to summarize a much more detailed report of Phase 1 of the State of Arizona Water Plan, Inventory of Resource and Uses. The report presents information on existing water uses and supplies, population, economy, and water law; identifies major water problems and needs; and compiles, summarizes and condenses existing data in a format which provides readily accessible information to the lay reader, state and local planners, developers, and citizens curious about the water resources of the state. Arizona's principal and fundamental water problem is that of imbalance between supply and use. For years Arizonans have been using water faster than it can be replenished. Some of the conclusions reached in this study are: 1, substantial amounts of groundwater remain in storage; 2, dependable surface water supplies are concentrated in Maricopa and Yuma counties; 3, agriculture consumes 89 percent of all water used in the state; and 4, the rate of water consumption in Pima County (Tucson) exceeds supply 4.7 times. Additional data and analyses are needed, especially for adequate groundwater pumpage information. (Jamail-Arizona)
W77-04782

THE MANAGEMENT OF URBAN COASTAL RESOURCES,
New York Sea Grant Inst., Albany.
M. L. Moss.
Reprint No. NYSSGP-RS-76-023, 1976. Reprint from: Oceans '76 Annual Combined Conference of Marine Technology Society and Institute of Electrical and Electronic Engineers, Washington, D.C., Sept 13-15, 1976. 5 p, 12 ref.

Descriptors: *California, *Management, *Resources development, Estuaries, Harbors, *Land use, Water resources, Urbanization, Planning, Coasts.
Identifiers: *Coastal zone management, Environmental protection, Public ownership, Urban population, Population pressure.

Urban populations are generating intense pressure for the utilization of coastal resources. Coastal management programs must be concerned with expanding the opportunities for use of the coastal zone as well as with the protection of the natural environment. One way to respond to social and economic demands for coastal resources is to increase the carrying capacity of the coastal zone in urban areas. This paper analyzes public ownership and leasing, which is a management tool that allows private development to occur within the framework of public control. Marina del Rey, the world's largest small craft harbor, is a multi-activity coastal community created through such a leasehold system, which serves a diversity of uses within one overall project. If efforts to protect natural coastal areas are to succeed, it will be necessary to determine ways to accommodate pressures for coastal activities through the development and redevelopment of the urban coastal zone. (NOAA)
W77-04845

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART C, LITTLE ARKANSAS RIVER BASIN,
Kansas Water Resources Board, Topeka.
J. J. Pinney, J. A. Henderson, and D. F. Kostecki.
1975. 3 fig., 31 tab., 29 maps, 52 ref.

Descriptors: *River basin development, *River basins, *Comprehensive planning, *Non-structural alternatives, *Groundwater potential, *Drainage districts, Water supply, Water distribution(Applied), Water allocation(Policy), Water

management(Applied), *Kansas, Planning, Regional development, Multiple-purpose projects, Groundwater basins, Groundwater availability, Groundwater, Groundwater resources, Flood control, Channel improvement, Flood protection, Irrigation districts, Irrigation permits, Treatment facilities, Alternative planning, Rural areas, Water districts.
Identifiers: *Little Arkansas River Basin(Kans), Little Arkansas River(Kans), Equus Beds(Kans), Demography.

The 1,409-square mile Little Arkansas River basin in south-central Kansas, according to a comprehensive study of present and future needs and problems of the region through the 2000, will undergo a significant decline in groundwater levels during the next 25 years if abatement measures are not taken. The basin also has problems with poor water quality, flooding and insufficient recreational facilities. These and other basin problems require that some type of management district be formed to establish a desirable long-term rate of dewatering of the Equus Beds (a groundwater reservoir), to guide surface water development, and to protect and enhance the quality of available water supplies. A single multipurpose district is recommended which would encompass powers and duties of all water-related special-purpose districts presently extant in the basin. However, no legislative provision for this type of district now exists in Kansas. In addition to the recommendations concerning nonstructural water resources planning, the study cites present and future needs for additional treatment plants, alternative water supplies for certain districts, limitations on water rights for irrigation, formation of certain rural water districts, flood protection projects, channel improvements, construction of small reservoirs, development of flood control plans, and other problem areas. (Harris-Wisconsin)
W77-04851

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART B, KANSAS LONG RANGE WATER REQUIREMENTS.
Kansas Water Resources Board, Topeka.
1972. 125 p. 6 fig., 58 tab., 40 ref., 3 append.

Descriptors: *Water demand, *Kansas, *Long-term planning, *Comprehensive planning, *Forecasting, *Future planning(Projected), Economics, Human population, Employment, Industrial production, Irrigation water, Recreation demand, Water users, Water shortage, Water allocation(Policy), Dependable supply.

Published as the second half of the Kansas state water plan, the report on future water needs is a baseline comprehensive study supported by projections of the Kansas economy. Economic forecasts are given for production output, employment and population from 1965 through 2000. Water withdrawals in 1965 are described for irrigation, rural domestic and livestock use, industrial use, and urban domestic use. Projected water requirements for the period 1980-2000, based on economic forecasts for 69 industry groups in the state at 20-year intervals, were combined into 20 regional industry sectors; separate projections were then provided for the state as a whole and for each of 11 multicounty regions. Appendices list individual county requirements and long-range water requirements by nine user groups: irrigation, livestock, mining, construction, manufacturing, transportation, utilities, urban domestic and commercial, rural domestic. Analytical techniques used in making the economic projections were given in a separate report cited by the study. (Harris-Wisconsin)
W77-04852

CONSERVATION AS A MAJOR ALTERNATIVE,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 3E.
W77-04854

STATE OF DELAWARE NEW CASTLE COUNTY RIVER BASIN, WATER QUALITY MANAGEMENT PLAN.
Delaware State Dept. of Natural Resources and Environmental Control, Dover.
For primary bibliographic entry see Field 5G.
W77-04856

STATE OF DELAWARE SUSSEX COUNTY RIVER BASIN, WATER QUALITY MANAGEMENT PLAN.
Delaware State Dept. of Natural Resources and Environmental Control, Dover.
For primary bibliographic entry see Field 5G.
W77-04857

AN EVALUATION OF TITLE III WATER RESOURCES PLANNING GRANTS IN STATES,
Arizona Univ., Tucson. Inst. of Government Research.
For primary bibliographic entry see Field 6E.
W77-04902

NATIONAL SYSTEMS OF WATER ADMINISTRATION.
Department of Economic and Social Affairs (UN), New York.
For primary bibliographic entry see Field 6E.
W77-04914

IMPLEMENTING THE COASTAL PLAN: A NEW TEST FOR THE CONCEPT OF STATE CONTROL FOR AREAS OF CRITICAL STATE CONCERN,
Arizona Univ., Tucson. School of Law.
For primary bibliographic entry see Field 6E.
W77-04922

GEOLOGICAL SURVEY RESEARCH 1975.
Geological Survey, Reston, Va.
For sale by Supt. of Documents, GPO, Wash., D. C. 20402, price $5.00. Professional Paper 975, 1975. 373 p, 11 fig, 4 tab, 373 ref.

Descriptors: *Projects, *Geological surveys, *Programs, Investigations, *Water resources, Mineralogy, Land use, Geologic mapping, Hydrogeology, Aquifers, Surface waters, Remote sensing, Satellites(Artificial), Chemical analysis, Analytical techniques, On-site investigations, Laboratory tests, Methodology, Data collections, Reviews.

'Geological Survey Research 1975' is the 16th annual synopsis of the results of U.S. Geological Survey investigations. These studies are largely directed toward the development of knowledge that will assist the Nation to use and conserve the land and its physical resources wisely. They are wide ranging in scope and deal with almost every facet of solid-earth science and fact finding. Many of the studies are continuations of investigations that have been in progress for several years. But others reflect the increased attention being given to problems that have assumed greater importance in recent years--problems relating to mineral fuels and mineral resources, water quality, environmental impact of mineral resources, land-use analysis, earthquake hazards reduction, subsidence, and the applications of LANDSAT data, to cite a few examples. (Woodard-USGS)
W77-04974

DEVELOPING CRITERIA TO CLASSIFY WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Sociology.
J. E. Carlson, D. L. Grant, E. L. Michalson, and J. H. Van Leuven.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB 264 039, Price codes: A07 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, November 1976. 117 p, 11 fig, 30 tab, append. OWRT B-029-IDA(1), 14-31-0001-4075.

Descriptors: Decision making, Economics, Social aspects, *Wild rivers, Recreation, Scenery, *Wild Rivers Act, *Idaho, Attitudes, Aesthetics, Classification, Alternative planning, Criteria.
Identifiers: Priest River(Ida), Priest Lake(Ida), *Wild and Scenic Rivers(Idaho).

A four year interdisciplinary effort to develop river classification alternatives from a set of matrix parameters is summarized. The matrix represents a numerical weighting of physical, economic and comminity density values for each of six natural river stretches along Priest River and Priest Lake, Idaho. The matrix values can then be used to compare the suitability of each of the six individual river stretches with the tree classification criteria (wild, scenic, recreational) specified under the National Wild and Scenic Rivers Act. Moreover, the matrix values are indicative of possible tradeoffs among physical, biological, economic, and social values facing public managers in maintaining wild and scenic rivers. The matrix serves as the final product for five interrelated investigations dealing with physical/hydrologic characteristics, land market values, public attitudes, aesthetic values, and legal implications. Not all of the findings from the five investigations were quantifiable under the matrix as developed. As well, no single classification scheme is argued as a result of the matrix, though the matrix does serve as a decision-making input.
W77-04995

OUTDOOR RECREATION IN WATERSHED RESERVES,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. E. T. Moncur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 038, A03 in paper copy, A01 in microfiche. Technical Memorandum Report No. 49, February 1976. 35p, 5 fig, 7 tab, 23 ref. OWRT A-057-HI(1). 14-31-0001-5011.

Descriptors: *Recreation, *Nitrates, *Coliforms, *Viruses, *Hawaii, Soil properties, Watercosts, Shorelines, Bacteria, Watersheds(Basins), Nitrogen compounds, Environmental effects, Water pollution, *Watershed management.
Identifiers: *Watershed reserves, Watershed zones, Mountain recreation, Fishing programs, Oahu(Hawaii).

Oahu's closed watershed reserves include over 6,880 ha (17,000 acres), almost 4.5% of the island's surface area, from which public access is virtually forbidden. This access restriction grows from concern with protecting the quality of groundwater recharged into Honolulu's water supply system. Several recent studies, however, suggest that some human incursion in wilderness areas, such as hunting, fishing and other light recreational activities, will not substantially harm water quality, and may even improve it. Concentrating on a portion of the Honolulu watershed including a large reservoir, Nuuanu Reservoir No. 4, this report examines the background of the current access policies and investigates available information concerning potential economic and physical consequences of opening the area to limited recreational activity.
W77-04996

SYSTEMS APPROACH TO WATER MANAGEMENT.
Department of the Environment, Ottawa (Ontario). Environmental Systems Branch.
For primary bibliographic entry see Field 6A.
W77-05008

SYSTEMS APPROACH TO WATER MANAGEMENT,
Department of the Environment, Ottawa (Ontario). Environmental Systems Branch.
For primary bibliographic entry see Field 6A.
W77-05009

SURFACE-WATER QUANTITY MANAGEMENT MODELS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-05013

ECONOMIC MODELS,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W77-05017

MULTIOBJECTIVE WATER-RESOURCES PLANNING,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W77-05018

MATHEMATICAL MODELING AND WATER-RESOURCES DECISION-MAKING,
Department of the Environment, Ottawa (Ontario). Environmental Systems Branch.
For primary bibliographic entry see Field 6A.
W77-05019

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 5-6, 1974,
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
January 31, 1975. 73 p, 4 fig, 1 tab.

Descriptors: *North Carolina, *South Carolina, *Georgia, Water resources, *Coastal plains, Coasts, Coastal marshes, Coastal engineering, Water resources development, Water users, Fisheries, Marine fisheries, Tourism, Recreation, Recreation demand, Recreation facilities, Planning, Mineral industry, Oil industry, *Southeast U.S.
Identifiers: Coastal waters, *Coastal zone management.

This is a compilation of scientific and technical information submitted by various participants of the Conference on Marine Resources of the Coastal Plains States. The Coastal Plains Regional Commission created the Coastal Plains Marine Center which sponsored the conference. The Center assists in the development of marine resources in the states of North Carolina, South Carolina and Georgia by functioning as a clearing-house for information on the marine environment of the region. Various articles deal with aspects of sport fishing in the region, including recreational fisheries, marine-based recreation and tourism of the coastal plains states, the seafood market development, and three articles deal with recent developments in coastal zone planning at the state level. The booklet also contains an article by the study director of the Coastal Plains Regional Commission concerning the deepwater terminal study. (See also W77-05030 thru W77-05036) (Welsh-Florida)
W77-05029

THE (COASTAL PLAINS REGIONAL CENTER) DEEPWATER TERMINAL STUDY,
Coastal Plains Regional Commission, Washington, D. C.
J. K. Schafer.
In: Report of the Conference on Marine Resources of the Coastal Plains States, December 5-6, 1974, p. 1-2, published by Coastal Plains Center for Marine Development Services, Wilmington, North Carolina.

Descriptors: *Deepwater, *Coastal plains, *Coastal structures, *Coastal engineering, *Environmental effects, Coasts, Environmental control, Environment, Water resources, Waste water disposal, Atlantic Coastal Plain, Atlantic Ocean, Sites.
Identifiers: *Coastal zone management, Coastal waters.

Evaluated in this article is the Coastal Plains Regional Center Deepwater Terminal Study. The Coastal Plains Regional Commission began an analysis of the South Atlantic region as a possible area for future development of a deepwater terminal. Meetings were attended by state officials, oil company representatives and Commission members. The scope of services required to be developed were of six major types: unloading facilities, crude oil storage facilities, refineries, any associated petrochemical industries, crude oil pipelines, and distribution terminals for the refined product. The study then began to search for low conflict areas to be considered as sample sites to analyze possible environmental impact. Several problems were to be considered and included gaseous hydrocarbon emissions, water availability, and wastewater handling. The author further recognizes the need for coastal zone management in the marine resources area. (See also W77-05029) (Welch-Florida)
W77-05030

RESPONSIBLE DEVELOPMENT AND REASONABLE CONSERVATION,
D. Stick.
In: Report of the Conference on Marine Resources of the Coastal Plains States December 5-6, 1974, p. 3-6; published by Coastal Plains Center for Marine Development Services, Wilmington, N.C.

Descriptors: *Conservation, *Land management, *Water resources development, *Adoption of practices, *Water conservation, *Planning, Projections, Decision making, Forecasting, Management, Water management(Applied), Water users, Water quality, Water policy, Marshes, *Land use.
Identifiers: *Coastal waters, *Land use planning.

Many conflicting issues have been propounded in the environmental protection controversy. In this article a conservation minded, ecology-oriented land developer urges a middle of the road approach to solve some of the pressing ecological problems. Although recognizing that the extremists on one side or the other are generally the most dedicated and vocal in their approaches, the author examines some of the extremists' positions, questions their real motivation, and attempts to show the interlocking goals behind the various views. Land use planning is suggested as a means to balance the extreme positions. Balancing the various special interest groups can be difficult especially in the areas where it is needed most. Many of the affected groups do not feel a need for planning. Water use planning must be organized separately, not as one element of a larger plan. The vast segment of the populace, which in all likelihood occupies a middle ground in its approach to conservationist's concerns and developer's interests, should be informed of the ever increasing need to balance interests, and to plan now in order to protect our resources. (See also W77-05029) (Welch-Florida)
W77-05031

A VIEW OF CARACAS,
Deepsea Ventures, Inc., Gloucester Point, Va.
For primary bibliographic entry see Field 6E.
W77-05032

COASTAL PLANNING FOR PLEASURE BOATING,
Rhode Island Univ., Narragansett. New England Marine Resources Information Program.
N. W. Ross.
In: Report of the Conference on Marine Resources of the Coastal Plains States, p. 39-41; published by Coastal Plains Center for Marine Development Services, Wilmington, N. C.

Descriptors: *Recreation demand, *Recreation facilities, *Recreation, *Boating, *Planning, Boats, Water users, Water resources, Water demand, Water policy, Competing uses, Competition, Comprehensive planning, Water sports, Coasts, Priorities, Public access.
Identifiers: Coastal waters, *Coastal zone management, Water rights(Non-riparian).

This article examines the need for recreational boaters to make their interests known within coastal zone planning development. Recreational interests are urged to develop new methods and technology for learning to service their own needs and become a beneficiary of coastal planning which is progressing either with or without input from recreational interests. The Coastal Zone Management Act of 1972 requires each coastal state decide how its shoreline will be used. Competition for prime coastal lands is becoming more urgent. Recreators are typically a fragmented group who do not function as a strong voice against othe coastal land users such as power companies, commercial shipping, developers and even conservationists. Coastal planners need to define the various values necessary for quality use and successful competition among users including recreation values and demand. The author suggests 15 problem areas and planning concepts for recreational boating. Foremost among these is a need for federal priority re-orientation along with added access to recreational waters aided by upgrading the commercial facilities available. (See also W77-05029) (Welch-Florida)
W77-05033

NORTH CAROLINA'S COASTAL AREA MANAGEMENT ACT,
North Carolina State Dept. of Administration, Raleigh. Office of Marine Affairs.
For primary bibliographic entry see Field 6E.
W77-05034

STATE COASTAL MANAGEMENT PROGRAMS,
South Carolina Coastal Zone Planning and Management Council, Charleston.
For primary bibliographic entry see Field 6E.
W77-05035

THE WATER MANAGEMENT CONSTITUTIONAL AMENDMENT PRO: CON:,
For primary bibliographic entry see Field 6E.
W77-05043

BUREAUCRATIC SUPPLY AND LEGISLATIVE DEMAND: IMPLICATIONS FOR WATER RESOURCES PLANNING,
California Univ., Berkeley. Graduate School of Public Policy.
S. H. Hanke.
Journal of Soil and Water Conservation, Vol 30, No 4, p 158-59, 1975.

Descriptors: *Cost-benefit analysis, *Cost analysis, *Cost-benefit ratio, *Cost-benefit theory, *Cost transfer, Cost trends, Cost sharing, Cost comparisons, Cost allocation, Water resources, Water costs, Project benefits, Project planning, Projects, Competition, Competitive prices.

Benefit-cost evaluation for investments in water resources projects, guided by the recommendations of the Water Resources Council, have

become more sophisticated. However, the conceptual validity and methodological feasibility of some of the new procedures is questionable. The bureaucratic and legislative institutions of government largely allocate resources by other than benefit-cost analysis. The bias of bureaucratic supply and legislative demand generates too many water resource projects, especially in the federal government. Because of the bureaucratic preferences and incentives, its members do not necessarily seek the socially optimal level of outputs and spending. The authors recommend more competition in providing water resource projects by gradually dismantling the federal establishment and allowing state and local governments to assume the financing of water resource projects. Introducing more competition would result in more desirable allocation of resources and more efficient provision of projects. (Welch-Florida)
W77-05055

IN-STREAM APPROPRIATION FOR RECREATION AND SCENIC BEAUTY (COMMENT ON IDAHO DEPARTMENT OF PARKS V IDAHO DEPARTMENT OF WATER ADMINISTRATION),
For primary bibliographic entry see Field 6E.
W77-05057

OREGON COASTAL ZONE LAND: USE, OWNERSHIP, AND VALUE CHANGE,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
R. M. Northam, T. J. Maresh, and M. L. Nolan.
Pub No ORESU-T-75-006, Dec 1975. 56 p, 6 fig, 21 tab.

Descriptors: *Oregon, *Coasts, *Land use, Data collections, *Land tenure, Appraisals, *Land management, Planning, Littoral, Bays, Recreation, Beaches, Erosion, Streams, Climates, Land resources, Seashores, Agriculture.

The Department of Geography at Oregon State University initiated this study in an effort to determine the relation between changes in land ownership and changes in land use in the coastal zone of central Oregon. Since no precise definition of a coastal zone was available, for purposes of the study the seaward limit was chosen as the seaward extent of cadastral units in the private sector and the inner margin was established as one section east of the highway paralleling the coast. Public lands were excluded from the study. The study was limited to unincorporated areas of Lincoln and Tillamook counties. The analysis of the change in land use occurring between 1967 and 1973 showed a trend toward an increase in year-round and vacation housing and commercial use and a decrease in timber and agricultural uses. The majority of land owners in the study area were non-residents. The authors conclude that the coastal zone is in a transitional period in terms of use of the land resources of the area. (Capehart-Florida)
W77-05058

COASTAL ZONE MANAGEMENT AND INTERGOVERNMENTAL COORDINATION,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
For primary bibliographic entry see Field 6E.
W77-05059

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMICS AND TECHNOLOGY FOR CONTROLLING DAIRY FEEDLOT RUNOFF,
Soil Conservation Service Hyattsville, Md.
For primary bibliographic entry see Field 5G.
W77-04611

SET SEWER RATES THAT REFLECT USE,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-04663

SEWER CLEANING SYSTEM COMBINES VERSATILITY, LOW INITIAL COST,
Monroe Water and Sewer Maintenance, N. C.
For primary bibliographic entry see Field 8G.
W77-04664

WATER DEEDS: A PROPOSED SOLUTION TO THE WATER VALUATION PROBLEM,
Arizona Univ., Tucson, Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-04792

COASTAL ZONE MANAGEMENT: THE PROCESS OF ACHIEVING EQUILIBRIUM,
Georgia State Office of Planning and Budget, Atlanta. Planning Div.
For primary bibliographic entry see Field 6E.
W77-05036

6D. Water Demand

SUMMARY, PHASE 1 - ARIZONA STATE WATER PLAN: INVENTORY OF RESOURCE AND USES.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W77-04782

WATER DEEDS: A PROPOSED SOLUTION TO THE WATER VALUATION PROBLEM,
Arizona Univ., Tucson, Coll. of Business and Public Administration.
V. L. Smith.
Arizona Review, Vol. 26, No. 1, p 7-10, January, 1977.

Descriptors: *Water costs, *Water policy, *Water rights, *Water rates, *Equitable apportionment, Water distribution(Applied), Water supply, Water sources, *Arizona, Groundwater, *Competing uses, *Water utilization, Water shortage, *Water demand, Water conservation, Rationing(Water), Water consumption(Except consumptive use), Recharge, Water reuse.
Identifiers: *Tucson(Ariz), *Water deeds.

Water in the Tucson Basin is provided to users for only the cost of delivery. By introducing a system for pricing the unrecovered stock of water, the inherent scarcity in the Tucson Basin can be brought to bear upon the choices of many residents as to how much water to use. A proposal is presented which would legally limit the amount of water a person could use without paying an increased rate. 'Water deeds' would be issued, much like property deeds, allowing use of a specified amount of water each year. A second deed would convey the right to draw a certain amount of water in the future. Any user desiring to consume in excess of his/her proportionate share of natural recharge must exercise some of his/her proportionate share of deeded rights to the entire recoverable water stock. These deeds would be negotiable. The advantages and disadvantages of this proposal are discussed at length. The main advantage would be conservation of water brought about by the free choice of consumers. Disadvantages include high operating costs, possibility of fraud, and conflicts over water rights. Principal features of the proposed 'water deed' system are outlines. (Jamail-Arizona).
W77-04792

THE STATE OF KANSAS, STATE WATER PLAN STUDIES, PART B, KANSAS LONG RANGE WATER REQUIREMENTS.
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 6B.
W77-04852

CONSERVATION AS A MAJOR ALTERNATIVE,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 3E.
W77-04854

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN CROSBY COUNTY, TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 4B.
W77-04866

THE ROCKY ROAD TO WATER FOR ENERGY,
Loble, Picotte and Pauly, Helena, Mont.
For primary bibliographic entry see Field 3E.
W77-04904

FLORIDA'S SLICE OF THE OFFSHORE PIE,
For primary bibliographic entry see Field 6E.
W77-04909

PUBLIC PATRIMONY: AN APPRAISAL OF LEGISLATION AND COMMON LAW PROTECTING RECREATIONAL VALUES IN OREGON'S STATE-OWNED LANDS AND WATERS,
Oregon Joint Interim Committee on Environment, Agricultural and Natural Resources, Salem.
For primary bibliographic entry see Field 6E.
W77-04910

GETTING MORE FROM A LIMITED NATURAL RESOURCE.
For primary bibliographic entry see Field 6E.
W77-04911

WATER USE IN MISSISSIPPI, 1975,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-04972

COASTAL PLANNING FOR PLEASURE BOATING,
Rhode Island Univ., Narragansett. New England Marine Resources Information Program.
For primary bibliographic entry see Field 6B.
W77-05033

THE ENTITLEMENT TO MUNICIPAL WATER SERVICE: CONSTITUTIONAL PROBLEMS IN THE DETERMINATION OF A PUBLIC UTILITY SERVICE,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
For primary bibliographic entry see Field 6E.
W77-05053

6E. Water Law and Institutions

BILL PROTECTS FARMS FROM NUISANCE SUITS,
For primary bibliographic entry see Field 5G.
W77-04605

WASTE TREATMENT RULES WON'T PUT 'IMPOSSIBLE' BURDENS ON PRODUCERS,
For primary bibliographic entry see Field 5G.

W77-04616

WATER DEEDS: A PROPOSED SOLUTION TO THE WATER VALUATION PROBLEM,
Arizona Univ., Tucson, Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-04792

ENVIRONMENTAL CONCERNS OF (SWEDISH) WOOD-PROCESSING INDUSTRIES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5G.
W77-04828

FEDERAL AND STATE WASTE TREATMENT REGULATIONS AFFECTING SEAFOOD PROCESSORS IN GEORGIA,
Georgia Univ., Athens. Marine Extension Service.
J. O. Smith, and W. A. Bough.
Sea Grant Program, Marine Extension Bulletin No. 2, March 1976. 15 p, 2 fig, 6 tab, 5 ref.

Descriptors: *Georgia, *Waste treatment, *Regulation, *Water quality control, *Federal Water Pollution Control Act, *Water pollution sources, Federal government, State governments food processing industry, Water resources.
Identifiers: Seafood processors.

In 1972, Congress enacted the Federal Water Pollution Control Act Amendments of 1972 (1972 FWPCA), the most complex and broadly applicable water pollution control law to date. The purpose of this bulletin is to explain some of the important provisions of the Act which particularly affect the seafood industry in Georgia. The 1972 FWPCA imposes strict wastewater treatment requirements on persons, corporations, municipalities or anyone who 'discharges pollutants' into almost any waters in the nation. Since the 1972 FWPCA in its present form effects some basic changes in state approaches to water pollution control, an outline of the federal law should be helpful. (NOAA)
W77-04840

THE PUBLIC TRUST DOCTRINE: A VIABLE APPROACH TO INTERNATIONAL ENVIRONMENTAL PROTECTION,
Denver Univ., Colo. International Legal Studies Program.
V. P. Nanda, and W. K. Ris.
Ecology Law Quarterly, Vol. 5, No. 265, p. 291-319, 1976. 297 ref.

Descriptors: *United Nations, *Environment, *Reservation doctrine, *Jurisdiction, International commissions, International law, International waters, Treaties, Foreign countries, Protection, Antarctic, Public lands, Public rights, Water law, Legal aspects, Common law, Constitutional law, Federal-state water rights conflicts.
Identifiers: *Public trust doctrine, Global regulation.

A modification of the U.S. public trust doctrine is recommended as a means to protect, preserve and improve the global environment. The doctrine as evolved in this country placed responsibility in the hands of the state and federal governments to act as public guardians of certain valuable natural resources which are not capable of self-regeneration and for which substitutes cannot be made by man; the approach recommended here would place guardianship in the hands of the United Nations through one of its subunits to encompass: (1) the uses of both living and nonliving resources of ocean space, air space, and such other common areas as Antarctica; (2) the uses and potential resources of outer space; and (3) territorial uses and resources of global importance because of their genetic, aesthetic, cultural or historical value. Description is given of the historical development of the public trust doctrine and its application in the United States, including navigable waters tidelands, wildlife, parks and historic sites. Current public trust administrative practices are traced, including protection of interests, and duties of the trustee. Other sections deal with the concept as interpreted in other nations, the efficacy of the doctrine and the concept as developed to date in the international arena. (Harris-Wisconsin)
W77-04853

AN EVALUATION OF TITLE III WATER RESOURCES PLANNING GRANTS IN STATES,
Arizona Univ., Tucson. Inst. of Government Research.
H. Ingram, M. Bradley, and D. Ingersoll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 906, Price codes: A09 in paper copy, A01 in microfiche. Prepared for U.S. Water Resources Council, October 1973. 159 p, 18 tab, 2 map.

Descriptors: *Evaluation, *Water Resources Planning Act, *Water resources development, *Comprehensive planning, *State governments, Federal government, Planning, Legislation, Regional development, Research and development, Resources, Social aspects, Water policy, *Grants, Training, Universities, Local governments, Government finance, Projects, Governmental interrelations, Political aspects, U.S. Water Resources Council.

In 1965 Congress authorized a ten-year grant program for comprehensive water and related land resource planning, the Title III grant program and the Water Resources Planning Act. Congress intended the planning to be coordinated between the federal and state governments. The program was specifically intended to aid state preparation of plans in light of regional and national plans for the development and use of a state's waters. After eight years, the program has not yet been funded up to the authorized level of five million dollars a year. The program's continuation past 1976 is in doubt. In an independent study of the grant program, the following questions were analyzed: the effectiveness of the program in accomplishing its purposes; the actual role played by the states in any planning process; the consequences of the discontinuation of the program after its original ten years; the impact of minor changes on the program as a whole. The authors conclude that Title III has been state-oriented, with its impact depending upon the objectives of individual states. The extent to which any goal is achieved depends upon the resources and strategy of the participant. Under Title III, the states rather than the federal government have had the stronger hand. (Moorhouse-Florida)
W77-04902

ENVIRONMENTAL LAW--WATER POLLUTION--EPA ADMINISTRATOR IS EMPOWERED TO PROMULGATE EFFLUENT LIMITATIONS--AMERICAN IRON AND STEEL V EPA, 526 F2D 1027 (3D CIR 1975),
For primary bibliographic entry see Field 5G.
W77-04903

THE ROCKY ROAD TO WATER FOR ENERGY,
Loble, Picotte and Pauly, Helena, Mont.
For primary bibliographic entry see Field 3E.
W77-04904

RESIDUAL WASTE: MODEL STATE LEGISLATION,
Environmental Protection Agency, Washington, D.C. Div. of Water Planning.
For primary bibliographic entry see Field 5G.
W77-04905

THE TRANS-ALASKA PIPELINE AND STRICT LIABILITY FOR OIL POLLUTION DAMAGE,
Washington Univ., St. Louis, Mo. School of Law.
For primary bibliographic entry see Field 5G.
W77-04907

WATER POLLUTION CONTROL REFORM IN IOWA: THE DEPARTMENT OF ENVIRONMENTAL QUALITY ACT OF 1972,
For primary bibliographic entry see Field 5G.
W77-04908

FLORIDA'S SLICE OF THE OFFSHORE PIE,
D. A. Smith.
University of Miami Law Review, Vol 30, No 1, p 215-22 (1975).

Descriptors: *Florida, *State governments, *State jurisdiction, *Coasts, *Boundary disputes, Offshore platforms, Seashores, Judicial decisions, Legislation, Legal aspects, Ownership of beds, Natural resources, Water law, Federal-state water rights conflicts, Federal jurisdiction, Federal government, Oceans, Gulf of Mexico.
Identifiers: *Coastal waters.

As interpreted by the United States Supreme Court, the Submerged Lands Act of 1953 granted Florida title to and ownership of the seabed and its resources lying within the Congressionally approved state boundaries, but in no event more than 3 geographical miles into the Atlantic Ocean or 3 marine leagues into the Gulf of Mexico. Other Supreme Court decisions determined that Florida's only claim to such seabed arose from the Act, and not from congressional approval of Florida's 1868 constitution. A special master rejected Florida's contention that the entire Straits of Florida were a part of the Gulf of Mexico, and instead adopted the boundary used by the International Hydrographic Bureau. The Superme Court also declared that the coastline from which the Submerged Lands Act was to be determined was ambulatory, that is, it would change as a result of erosion, accretion or the construction of permanent harbor works. Thus, Florida's Atlantic coastal boundary for the purposes of the Act is a line 3 geographical miles from its present coastline, and is subject to movement as the coastline changes. The special master then found Florida's Gulf boundary to be that part of the 1868 constitutionally declared boundary lying within 3 marine leagues of the present coastline. The ambulatory nature of the coastline will result in under-evaluation of offshore mineral leases because of the uncertainty as to future changes in the coastline which could result in the extinguishment of a leasehold. (Welch-Florida)
W77-04909

PUBLIC PATRIMONY: AN APPRAISAL OF LEGISLATION AND COMMON LAW PROTECTING RECREATIONAL VALUES IN OREGON'S STATE-OWNED LANDS AND WATERS,
Oregon Joint Interim Committee on Environment, Agricultural and Natural Resources, Salem.
J. Mc Lennan.
Environmental Law, Vol 4, No 3, p 317-81 (Spring 1974).

Descriptors: *Oregon, *Recreation, *Recreation demand, *Recreation facilities, *Legislation, Recreation wastes, Water demand, Social needs, Social participation, Economics, Parks, Beaches, Disposal, Litter, Waste disposal, Natural resources, Water utilization, Water policy, Scenic highways, Tourism, Access routes, Land use, Water users, Water law, Social aspects, Oceans.
Identifiers: *Public trust doctrine, *Navigability tests, *Coastal waters.

An evaluation and examination of Oregon's legislation protecting recreational values was conducted. The recreational values considered are

public rights, public regulation and public protection of unique qualities. These values are used to assess the public right to gain access to and use public lands and waters, the controls available to referee the competition for use, enjoyment and development, and the protection afforded unique values for the benefit of this and future generations. The article discusses statutory and case law respecting the ocean, its shoreline and other waters of the state. Navigability, waters available for service and consumptive use, and state proprietorship over publicly owned submerged land are also examined. Protective regulation concerning fill and removal laws has been applied to both public and private property. The Oregon state park system has been closely associated with the highway program and has not been developed as a comprehensive scheme. The state responded with a number of preservative or use-oriented plans which developed into recreational legislation. In order to protect the resources from threatened overuse, the author suggests more comprehensive legal priorities to anticipate and protect against competing resource users. (Welch-Florida)
W77-04910

GETTING MORE FROM A LIMITED NATURAL RESOURCE.
Western Water, (Association of California Water Agencies, Sacramento), p 3-6, (Sept-Oct 1976). 5 photo.

Descriptors: *California, *Water reuse, *Water shortage, Waste water treatment, Construction, Water demand, Water utilization, Alternative water use, Governments, Legislation, Local governments, Water conservation, Water resources, Reclaimed water, Economic feasibility, Attitudes, Social aspects, Supply, Demand, Water rights.
Identifiers: *FWPCA Amendments of 1972, *Clean Water Grant Program.

Increased effort is being directed to more efficient use of California's limited water resources. Water reuse, or recycling, is a possible solution to the problem. Wastewater reclamation appears to offer a means toward reaching a balance between supply and demand. The Water Pollution Control Act of 1972 requires treatment to produce water whose quality makes it suitable for many uses. However, wastewater reclamation has to resolve institutional problems, reduce high economic costs, and ameliorate the disdain of the public for using what was once sewage water. Water reuse is encouraged somewhat through federal and state Clean Water Grant Programs which provide funds for the construction of municipal wastewater treatment facilities to meet state and national water pollution control objectives. Two legislative changes are proposed to further facilitate wastewater reclamation. One seeks to provide that whenever cessation of or the reduction in the use of water under an existing right occurs because of the substitution of reclaimed water, the right will not be subject to loss or reduction. The change would defer the existing right so that the threat of loss will not deter the right holder from using reclaimed water. Another change calls for State Board review of water supply contracts to require the use of reclaimed water to the greatest extent possible. The second suggestion would have the undesirable side effect of creating an administrative burden for those charged with its enforcement. (Rieck-Florida)
W77-04911

HOUSE OVERSIGHT HEARINGS: BEARING THE LAW'S DELAY (1972 AMENDMENTS TO FEDERAL WATER POLLUTION CONTROL ACT),
For primary bibliographic entry see Field 5G.
W77-04913

NATIONAL SYSTEMS OF WATER ADMINISTRATION.
Department of Economic and Social Affairs (UN), New York.
For sale by United Nations, Sales Section, New York, New York. Sales No. E. 74. 11. A. 10. $8.00. Report ST/ESA/17, 1974. 183 p, 3 fig.

Descriptors: *United Nations, *Water management(Applied), *Water resources development, Water utilization, Political aspects, Foreign countries, Mexico, Planning, Economic efficiency, Regional analysis, Economic feasibility, Irrigation, Hydroelectric power, Water allocation(Policy), Water rights, Publications, Information exchange.
Identifiers: India, Israel, Spain, Hungary, Algeria.

Development of water resources is a fundamental component of the development of a nation. The United Nations commissioned a study of water administration in developing nations in order to provide information to other countries for improvement of their water policies and administration. The six countries selected were Algeria, Hungary, India, Israel, Mexico and Spain; they represent the major climatic, economic and social conditions in the world. The first part of the study compares the approaches taken by these countries in the following areas: economic and ecologic efficacy of water resources; planning capability and policy-making capacity; organizational status and effectiveness; degree of effectual devolution; administrative drive and proficiency; and, administrative priorities and developmental determinants. Part two includes studies done by each country, except Algeria, of the country's own water resources administration. (Capehart-Florida)
W77-04914

MARITIME LAW: TO FISH OR CUT BAIT.
Newsweek, Vol. 87, No. 10, p. 64, 66, March 8, 1976. 1 photo.

Descriptors: *Continental shelf, *Water resources development, *Law of the sea, *United Nations, *Fishing, Legal aspects, Environmental effects, Navigation, International law, Water law, Oceans, Mining, Mining engineering, Manganese, Nickel, Cobalt, Water pollution, Oil pollution, Copper.
Identifiers: *Water rights(Non-riparian), *Coastal waters.

The Third United Nations Law of the Sea Conference is meeting in 1976 to formulate specific treaty provisions concerning deep-sea mining on the ocean beds. Poorer nations find themselves in opposition to the richer industrialized states; they are afraid that manganese, copper, nickel and cobalt prices will drop drastically with the advent of profitable deep-sea mining. Other poor nations want price breaks and help in mining ventures that they cannot afford by themselves. The industrialized nations, on the other hand, are eagerly awaiting the drop in raw material prices that will be forthcoming, and have no desire to help poorer nations in their mining ventures. This failure to reach agreement means that the United States will almost certainly adopt a 200-mile limit in January, thereby preserving its deep-sea rights. Other nations are expected to follow suit. The prizes in this dispute are estimated at 40 billion dollars worth of oil, and up to three trillion dollars worth of metals. If the poorer nations cannot be satisfied and agreeement cannot be reached, economic nationalism on the high seas will surely be the coming trend. (Frank-Florida)
W77-04917

A 200-MILE LIMIT TO PROTECT U.S. FISHING RIGHTS, AND NOW, U.S. GETS ITS OWN 200-MILE LIMIT,
U.S. News and World Report, Vol. 80, p. 30-31, February 9, 1976; p. 53, April 19, 1976. 3 photo, 7 dwg.

Descriptors: *Continental shelf, *Law of the sea, *International law, *United Nations, *Federal government, Fishing, Fish harvest, Commercial fish, Fish populations, Fish farming, Organizations, Foreign countries, Governments, Shores, Continental margins, Continental slope, Oceans, Water law, United States, Legal aspects.
Identifiers: *Coastal zone management.

The United States Congress has passed legislation that will give the United States a 200-mile economic zone around its shores. It will forbid unlicensed fishing by vessels of other nations within this area, effective March 1, 1977. At the same time, the United Nations is attending the Third Law of the Sea Conference and is trying to work out issues that are as numerous as they are complex. Rights to seabed minerals, territorial limits, fishing rights and responsibility for pollution are just a few of the problems pressing for solution. Two separate views predominate in the current negotiations: that of the Group of 77, which is the bloc of developing nations, and that of the industrial nations. The former want development of the seabed to be controlled by an international authority that would have exclusive rights to explore, mine, and market all minerals found in international waters. The industrial nations are willing to make some concessions as to the exclusive nature of the development, but still wish to retain the ability to exploit seabed resources on their own. The success of the Conference hinges on a resolution of these differing viewpoints. (Frank-Florida)
W77-04918

TIME BOMB IN THE MEDITERRANEAN,
For primary bibliographic entry see Field 5G.
W77-04919

TOWARD A NATIONAL OCEAN POLICY: 1976 AND BEYOND,
Johns Hopkins Univ., Ocean Policy Project, Washington, D.C.
R. E. Osgood, A. L. Hollick, C. S. Pearson, and J. C. Orr.
Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Price $2.60, Stock Number 038-000-00263-5. Report NSF-RA-X-75-006, February 1976. 207 p, 1 ref. GI 39643.

Descriptors: *Oceans, *Law of the sea, *International law, *Navigation, Ships, *Commercial fishing, Fish harvest, Fisheries, Federal government, Governmental interrelations, Foreign trade, International waters, Treaties, Jurisdiction, Resources, Continental shelf, Oil industry, Exploitation, Drilling, Coasts, Shores, Social aspects, Political aspects, Foreign waters.
Identifiers: *United Nations Law of the Sea Conference(1973), *Ocean Policy Project(Johns Hopkins University), Coastal waters, Contiguous zone, Territorial seas(Jurisdiction), Coastal zone management.

The ocean regime was relatively stable until the mid-20th century. Since then technological advances and the rising influence of developing countries have put the ocean regime into disarray. The third United Nations Law of the Sea Conference attempted to produce a comprehensive, detailed, and widely accepted ocean treaty, a goal which was not realized. However, the Conference was able to identify, clarify and differentiate ocean interests. This report highlights those problems paramount to the United States, such as national security, commercial navigation, marine environment, fisheries, mineral resources, and marine science. The main concern is the preservation of our economic interests. An important question is whether rights to control navigation ought to be vested in the coastal states or the international community. The United States ranks fifth in volume of fish harvested and fourth in terms of value, yet U.S. fishermen harvest less than 25% of the fish caught off U.S. shores. Such consideration

make a 200-mile coastal state economic resource zone a matter of controversy. Another concern in the United States is to gain access and jurisdiction over ocean minerals. In the respect the United States whole-heartedly favors extended coastal state jurisdiction rather than international control. (Moorhouse-Florida).
W77-04920

WHAT'S REALLY HAPPENING IN WESTLANDS,
R. M. Brody.
Western Water, (Association of California Water Agencies, Sacramento), p 4-5, May - June 1976. 1 photo.

Descriptors: *California, *Land reclamation, *Federal reclamation law, *Acreage, Agricultural engineering, Farm units, Farm management, Land developments, Land tenure, Land use, Legal aspects, *Water districts.
Identifiers: *Westlands Water District(Calif).

In connection with the 160 acre limitation of Federal reclamation law the Westlands Water District has been a recent focal point. The large ownerships now being broken up came into being because there was no other means of land development. The only available source of water, namely groundwater, was high cost and low efficiency so land yield was low. With water subsidy the situation changed. Those taking advantage of the subsidy, however, made a commitment to Congress that they would break up their holdings to comply with the limits. Even though the project is twelve years behind schedule, more land has been placed under recordable contract or sold into non-excess status by more landowners last year than in the 73 prior years of reclamation history. What had been farmed by 28 entities now involves 93. Many of the 160 acre tracts are farmed through pooling agreements, some owned by husbands, some by wives and children. About half the buyers are non-resident, but all sales have complied with law. (Comer-Florida)
W77-04921

IMPLEMENTING THE COASTAL PLAN: A NEW TEST FOR THE CONCEPT OF STATE CONTROL FOR AREAS OF CRITICAL STATE CONCERN,
Arizona Univ., Tucson. School of Law.
M. R. Schroeder.
S. Cal. L. Rev., Vol. 49, No. 4, p. 772-83 (1976).

Descriptors: *Preservation, *California, *Comprehensive planning, *Political aspects, *Governmental interrelations, Economic efficiency, Regional development, Non-structural alternatives, Water resources development, Local governments, Regulation, State governments, Planning, Multi-purpose projects, Legislation, Decision making, Protection.
Identifiers: *Coastal zone management, Coastal waters.

The California Coastal Plan recommendations contain an elaborate implementation structure which envisions local government regulation supervised by an independent state agency. This dual structure of regulation is analogous to that proposed in the Model Land Development Code. This plan's authors had a preservationist mandate, and it is the legislature's function to translate the plan into specific controls. If the legislature leaves the task of drawing the final boundaries of the critical area to the planning agency, the ultimate boundaries of the area to be brought under strict controls may be expected to expand. The present plan would permit state control of what is now solely the province of local government. Thus the proclaimed local control is really predicated on the state agency's discretion. Creating such a state agency as an authority independent of the normal political process raises serious questions, as does the delegation of appeals and management to the same body. Conflict is inevitable, however, when the values which the state agency is directed to protect are as difficult to define precisely as those contained in the legislature's charge to the California Coastal Commission. (Molloy-Florida)
W77-04922

JURISDICTION AND GROUNDS FOR DENIAL BY STATE AND FEDERAL AGENCIES OF DREDGE AND FILL OPERATIONS,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 5G.
W77-04923

FLOOD CONTROL REGULATIONS; MARSHALL FORD DAM AND RESERVOIR, COLORADO RIVER, TEXAS,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6F.
W77-04924

EFFLUENT GUIDELINES AND STANDARDS: PULP, PAPER, AND PAPERBOARD POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-04925

PROTECTION OF THE ENVIRONMENT: PAINT FORMULATING POINT SOURCE CATEGORY: PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-04926

NAVIGATION REGULATION: OHIO RIVER, MISSISSIPPI RIVER ABOVE CAIRO, ILLINOIS AND THEIR TRIBUTARIES,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 4A.
W77-04927

EFFLUENT GUIDELINES AND STANDARDS: PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-04928

FMC V TRAIN (VALIDITY OF EPA GUIDELINES FOR PLASTICS AND SYNTHETICS),
539 F2d 973-86 (4th Cir 1976).

Descriptors: *Judicial decisions, *Plastics, *Synthetic rubber, *Federal Water Pollution Control Act, *Water quality standards, Administration, Water law, Water pollution, Activated carbon, Chemical oxygen demand, Biochemical oxygen demand, Standards, Water pollution control, Abatement, Administrative decisions, Administrative agencies, Decision making, Legal aspects, Cost-benefit analysis, Technology.
Identifiers: *Environmental Protection Agency, *Effluent limitations, Total suspended solids.

Plantiffs, plastics manufacturers, challenged regulations issued by the Environmental Protection Agency (EPA) establishing effluent limitations guidelines for existing sources and standards of performance for new sources for the Plastics ans Synthetics Point Source Category. Plantiffs argued that the EPA erred in assessing technology available to implement the standards, in figuring the costs of compliance, and in the methodology used to compute effluent limits. The guidelines and standards were remanded for reconsideration by the EPA. The court held: (1) establishment of single-number limitations as opposed to ranges of values is witin the discretionary power of the administrator; (2) a cost-benefit analysis of ach regulation need not be made as Congress has set elimination of pollution as the ultimate goal; (3) hydraulic flow limitations for 1977 and 1983, based on demonstrated wastewater flows should be reconsidered by the EPA; (4) new source standards are remanded, and the EPA is to supply technological guidance necessary for compliance; (5) 1977 chemical oxygen demand parameters are unreasonble in view of anticipated activated carbon absorption processes, but may be found unreasonable later; (7) total suspended solids limits are reasonable; and (8) the EPA should have provided for excursions from the limitations. (Moorhouse-Florida)
W77-04929

HEFFERLINE V LANGKOW (STRUCTURAL RIGHTS OF ADJACENT RIPARIAN LANDOWNERS),
552 P2d 1079-83 (Ct App Wash 1976). 5 p.

Descriptors: *Washington, *Riparian rights, *Reasonable use, *Docks, *Competing uses, Ownership of beds, Recreation, Riparian land, Lakes, Recreation facilities, Land use, Littoral, Shallow water, Shores, Lake beds, Legal aspects, Lake shores, Recreation demand.

Plaintiff Sought removal of dock and fill material placed by adjacent riparian landowner in lake owned in common by the parties and other landowners. Plaintiff and defendants owned adjacent lots upland form a privately owned, non-navigable lake, holding under a convenant restricting use to that in common with other shre owners for bathing, swimming, boating and fishing only. Defendants constructed a dock extending from their property toward the center of the lake. Plaintiff alledged that the dock reduced the value of his property and constituted an intentional and unreasonable interference with his riparian and litoral rights. In Washington a given structure is legal if it (1) constitutes a riparian use, and (2) is reasonable. The court noted that a dock could legally be located within an area bounded by the extension of the divisional lines on shore to the line of navigability, or in this case the line defining the minimum depth necessary for the exercise of riaparian rights. The case was remanded to the trail court to apply these rules to the instant case to determine whether the dock is reasonable in view of all the interests involved. (Molloy-Florida)
W77-04930

JEFFERSON COUNTY V JOHNSON (COMPREHENSIVE LAND MANAGEMENT AND USE PROGRAM IN FLOOD-PRONE AREAS ACT),
333 So2d 143-49 (Ala 1976).

Descriptors: *Alabama, *Permits, *Building codes, *Flood protection, Construction, Floods, Streams, Legislation, Land tenure, Piles(Foundations), Obstruction to flow, Streamflow, Non-structural alternatives, Flood plain zoning, Legal aspects, Buildings, Channel improvement, Flood control.

Plaintiff land owners sought to compel defendant county to issue plaintiffs a building permit. The plaintiffs had applied for a building permit in order to construct an addition to a commercial building they owned. The addition was to be constructed over a creek bed with supporting pillars placed in the creek bed. The county engineer denied the permit, contending that the planned construction would impede the flow of water in the creek and would make any channel widening project impossible. The trial court ordered that a building permit be issued holding that the defendant did not have legal authority to deny a permit for those reasons. The Supreme Court of Alabama affirmed

saying that a county had only the authority granted to it by the legislature. The court examined the applicable statutes and said that the county engineer had no authority to prevent flooding since the county had not enacted any comprehensive land use and control measures for flood areas. (Capehart-Florida)
W77-04931

VALDER V WALLIS (ESTABLISHING TITLE TO ACCRETED PORTION OF INTERSTATE ISLAND),
242 NW2d 112-15 (Neb 1976).

Descriptors: *Nebraska, *Boundaries(Property), *Accretion(Legal aspects), *Missouri River, *Iowa, Legal aspects, Rivers, Adverse possession, Water law, Navigable waters, Waters, Riparian rights, Flow, Judicial decisions, Avulsion, Islands, Dikes, Streams, Channels, Channel flow, Bodies of water, River beds.

Plaintiff landowner brought action to quiet to accretion lands formed by the Missouri River. Plaintiff owned land on the Nebraska side of the river, while defendants owned land in Iowa adjoining the property in dispute. Defendants claimed ownership by adverse possession and accretion. The District Court decreed a division of the land in accordance with an exiting river chute and defendants appealed. The Nebraska Supreme Court affirmed, holding that at the time of the Iowa-Nebraska Boundary Compact (1943), the land was in Nebraska. By virtue of a shift in the bed of the river, the land, although on the Nebraska side of the boundary line, is on the Iowa side of the river. Thus,the accreted land remained a part of the property of the individaul who owned it prior to the change. The court further held that the defendants had failed to establish adverse possession of the island formed by the shift in the bed of the river. (Cowart-Florida)
W77-04932

COLORADO RIVER WATER CONSERVATION DISTRICT V UNITED STATES (THE DOCTRINE OF PRIOR APPROPRIATION AS APPLIED TO INDIAN WATER RIGHTS ON RESERVATIONS),
96 S. Ct. 1236-51 (1976).

Descriptors: *Water districts, *Colorado, *Adjudication procedure, *Preferences(Water rights), *Water rights, Appropriation, Federal-state water rights conflicts, State jurisdiction, Federal jurisdiction, Reservation doctrine, Indian reservations, Federal reservations, Judicial decisions, Legal review, Water law, Colorado River.
Identifiers: *Indian water rights, *Colorado River water conservation district.

Plaintiff United States brought suit seeking a declaration of its rights to waters in the Colorado River water district. The Federal District Court dismissed on the basis that the state court should have prior jurisdiction. The appellate court reversed and the United States Supereme Court affirmed the reversal but upheld the dismissal on other grounds. Secifically, the McCarran amendment does not divest federal courts of jurisdiction in matters of water rights adjudication. The McCarran amendment, however, establishes a policy of furthering unified water rights adjudication. In this case, the state of Colorado had available a system for adjudication and management of water use rights. Under Colorado legislation, a single continuous proceeding which reaches all claims is established and the proceeding antedates this suit. Factors weighing in favor of state adjudication include the following: responsibility for allocation management is given to the state; the suit involves over a thousand defendants, most of whom are in Colorado; and there is an absence of any extended proceedings in federal courts. The Indian rights involved can thus be determined in state court under the McCarran amendment. (Comer-Florida)
W77-04933

A VIEW OF CARACAS,
Deepsea Ventures, Inc., Gloucester Point, Va.
R. J. Greenwald.
In: Report of the Conference on Marine Resources of the Coastal Plains States, December 5-6, 1974, p. 23-24; published by Coastal Plains Center for Marine Development Services, Wilmington, N.C.

Descriptors: *International waters, *International law, *International commissions, *United Nations, *Law of the sea, Legal aspects, Oceans, Water law, Foreign waters, Treaties, Conferences, Data collections, Publications, Jurisdiction, Coasts, Governmental interrelations.
Identifiers: *Coastal waters.

Evaluated in this article are the results of the United Nations sponsored Conference on Law of the Sea which was held in Caracas, Venezuela. The conference turned out to be merely another preparatory session, rather than a substantive conference. Old issues were simply rebounded back and forth or transformed into new issues to be buried by the much abused one-nation-one-vote arrangement. A few areas of consensus were reached: recognition of the exclusive right of coastal states to exercise at least economic jurisdiction over coastal waters to a 200 mile limit and the right to extend territorial seas to a 12 mile limit. Pollution issues were given low priority in the conference schedule, but were used by developing countries to justify expanded coastal state jurisdiction over the uses of oceans off their coasts. Most developed countries supported a regime of nondiscriminatory access by all nations to seabed use under license from an international authority which would grant the licenses. The author suggests that alternative ways to attain equitable national and international objectives can be reached by use of regional and bilateral agreements and informed unilateral actions. (See also W77-05029) (Welch-Florida)
W77-05032

NORTH CAROLINA'S COASTAL AREA MANAGEMENT ACT,
North Carolina State Dept. of Administration, Raleigh. Office of Marine Affairs.
T. L. Linton.
In: Report of the Conference on Marine Resources of the Coastal Plains States, p 57-61; published by Coastal Plains Center for Marine Development Services, Wilmington, North Carolina.

Descriptors: *North Carolina, *Coasts, *Land use, *Land management, *Regional development, Regional analysis, Planning, Comprehensive planning, State governments, Water resources development, Water resources, Water conservation, Water law, Administrative agencies, Coastal plains, Coastal engineering, Legislation, Legal aspects, Regulation.
Identifiers: *Coastal zone management, Coastal waters.

Evaluated in this article are the recent attempts by the state of North Carolina to deal with its present and potential problems revolving around management of its coastal areas. Various state responses to coastal problems had begun with a major legislative package in 1969. Efforts continued and culminated in passage of a Coastal Area Management Act. Not only is the Act an environmental response, but it also deals with the problems of growth and intensive use of the land along with the resulting financial and administrative problems. The North Carolina Act establishes a well defined decision-making process to be utilized in the coastal areas. The Act requires local and state involvement in the process. Local areas desire to maintain control over their future while maintaining economic growth and environmental quality. The Act is designed to place a major portion of the decision-makin for future development in local hands. State government responds by providing money, technical assistance, guidelines for local planning, and a watchdog and enforcement function. Federal government also provides funds and general goals as enunciated in the Coastal Zone Management Act. North Carolina has recognized political realities while providing for realistic management. (See also W77-05029) (Welch-Florida)
W77-05034

STATE COASTAL MANAGEMENT PROGRAMS,
South Carolina Coastal Zone Planning and Management Council, Charleston.
M. Copeland.
IN: Report of the Conference on Marine Resources of the Coastal Plains States, p 63-64; published by Coastal Plains Center for Marine Development Services, Wilmington, North Carolina.

Descriptors: *South Carolina, *Coasts, *Coastal engineering, *Coastal plains, *Planning, Comprehensive planning, State governments, Water law, Water conservation, Water users, Water quality, Water resources, Water resources development, Administration, Coordination, Governments, Legislation, Management.
Identifiers: *Coastal zone management, *Coastal waters, *Federal Coastal Zone Management Act of 1972.

This article deals with the initial steps taken by coastal states to implement programs and planning under the Federal Coastal Zone Management Act of 1972. States have generally adopted the planning, elements and guidelines specified in the federal Act because coastal management was new to most of them. The coastal states have begun to take a second and more particularized look at their individual needs and programs, and they have realized that no single management agency can have sole authority for allocation of coastal resources. Utilization of other allocation mechanisms is needed along with flexible institutional arrangements to use the mechanisms. The author stresses the use of bargaining, both with developers and local governments, as a valuable tool for coastal management. The article outlines how South Carolina has begun to cover the three main areas in the Act: adequate public involvement; land use management; water quality and water use. (See also W77-05029) (Welch-Florida)
W77-05035

COASTAL ZONE MANAGEMENT: THE PROCESS OF ACHIEVING EQUILIBRIUM,
Georgia State Office of Planning and Budget, Atlanta. Planning Div.
L. R. Gess.
In: Report of the Conference on Marine Resources of the Coastal Plains States, p 65-68; published by Coastal Plains Center for Marine Development Services, Wilmington, N.C.

Descriptors: *Georgia, *Coastal plains, *Comprehensive planning, *Coasts, *Management, Coastal engineering, State governments, Water law, Legislation, Planning, Water resources development, Water resources, Coordination, Administration, Water users, Water conservation, Administrative agencies.
Identifiers: *Coastal zone management, *Coastal waters.

This article evaluates program development in Georgia under the Coastal Zone Management Act of 1972. The state has attempted to weld together the interests of local, state and national groups by utilizing twelve agencies to participate jointly in the development of a single program. Realizing the urban-rural conflict in approaches to problem solving, the state sought program development through active teamwork. The state has provided technical assistance to the agencies and their own technical committee and has developed a uniform land use classification system. All of the agencies have begun to focus on the economic development

of the coastal area. The author urges the adoption of more extensive zoning techniques as a mechanism to deal with coastal management. Georgia views the development of coastal management programs as a demonstration project for future projects in the state. (See also W77-05029) (Welch-Florida)
W77-05036

OCEAN DUMPING--PART 2.
For primary bibliographic entry see Field 5E.
W77-05037

TITLE, JUS PUBLICUM, AND THE PUBLIC TRUST: AN HISTORICAL ANALYSIS,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
P. Deveney.
Sea Grant Law Journal, (State University of New York at Buffalo), Vol 1, p 13-81, 1976.

Descriptors: *Coasts, *Common law, *Shores, *Land development, Legal aspects, Land management, Land use, Legislation, Judicial decisions, Water law, Social aspects, Public benefits, Public rights, Public lands, Public access, State governments, Competing uses, Planning, Optimization, Legal review, History.
Identifiers: *Public trust doctrine, *Roman law, Historical analysis, Private property, Coastal waters, Coastal zone management, Water rights(Non-riparians).

The immense value and finite nature of coastal area resources has led legal scholars to urge acceptance of the doctrines of the public trust and the jus publicum to protect the public's interests. The author examines the legislative power to grant fee simple title to foreshore and land underwater so as to extinguish the public's right therein. Historical analysis of both Roman law and early common law has revealed that there never has been an age of perfect public rights in an control over the coastal area. Neither has the coastal area ever been restricted to purely natural uses. The land-sea interface is necessarily an area of conflict between bona fide competing interests, which has not been resolved by use of the public trust doctrine. Case law dealing with the public trust is contradictory and confusing. Any attempt to deal with the competing interests of coastal areas must not rely on fleeting judicial ideas, but must recognize all interests as real interests. Private property interests as well as the public interest must be considered. Since the question of future allocation is actually one of sovereignty and the democratic process, any decisions should be made by the legislature and not the judiciary. (Moorehouse-Florida)
W77-05038

TOWARD THE TRUE MEANING OF THE PUBLIC TRUST,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
S. N. Berland.
Sea Grant Law Journal, (State University of New York at Buffalo), Vol 1, p 83-138, 1976.

Descriptors: *Coasts, *Public lands, *New York, *State governments, *Land management, Judicial decisions, Legal aspects, Social aspects, National seashores, Public benefits, Public access, Legal review, Navigable waters, Ownership of beds, Riparian rights, Constitutional law, Common law, Federal government, Regulation, Management, Resources, Resources development.
Identifiers: *Public trust doctrine, *Private property, Federal case law, Coastal waters, Coastal zone management.

Under the public trust doctrine land covered by navigable waters is said to be held by the sovereign as trustee for the public, and not as proprietor. The question is raised of what duties and obligations are imposed on the government in its administration of trust lands, and which uses or dispositions of the lands are beyond the bounds of legitimate governmental action. One theory is that lands held in public trust should be used only for public purposes. Others believe that the government can dispose of these lands as it would any other property it held. Still others believe such lands may be privately developed so long as the development benefits the public. The author explores the unique legal status of tideflowed and subaqueous land as it has developed in the New York and the federal courts, in order to demonstrate that these lands are properly the subject of regulations designed to guarantee that their utilization conforms to public need. The public trust doctrine is an authority source for affirmative regulations requiring utilization of coastal area resources when the state's citizens so demand. Governments will encounter resistance where the coastal area is privately owned. However, such lands can be developed privately to benefit the public. Thus divestment or invalidation of private title to formerly public resources should be implemented only where it is essential to the public need that title be vested in the state. (Moorhouse-Florida)
W77-05039

COASTAL PROCESSES AND CHANGE: LEGAL IMPLICATIONS,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
A. S. Bottar.
Sea Grant Law Journal, State University of New York at Buffalo), Vol 1, p 139-164, 1976.

Descriptors: *Accretion(Legal aspects), *Boundaries(Property), *Shores, *Avulsion, *Erosion, Bank erosion, Submergence, Coasts, Beach erosion, Land tenure, Boundary disputes, Common law, Judicial decisions, Ownership of beds, Repulsion(Legal aspects), Riddance(Legal aspects), Water law, Social aspects, New York.
Identifiers: *Coastal waters, Coastal zone management, Public policy.

Due to the dynamic nature of shorelines, legal systems have been forced to create a special set of rules in order to reconcile traditional notions of property ownership with shoreline processes. Common understanding and public policy were important factors in the formulation of these rules. Therefore, changed circumstances call for review and perhaps modification of traditional legal responses. New York law is used for illustration. The process of accretion usually vests title to the newly formed land in the adjacent estate if the following conditions are satisfied: (1) the additions of land are imperceptible; (2) ownership of immediately adjoining land is clearly established; (3) the deed contains flexible not static boundary lines; (4) the accretion was natural not artificial. The supporting arguments for this allocation scheme include accession, deminimus non curat lex, greatest productivity of land, natural boundary, compensation, and right of access. Similarly, the legal schemes designed to accomodate erosion and submergence and avulsion are examined. The arguments offered in support of each scheme are presented and analyzed. In each instance, while the present scheme is workable, revision of the rules would produce more equitable and consistent results. (Moorhouse-Florida)
W77-05040

JUDICIAL DECISION MAKING AND THE ADMINISTRATION OF COASTAL RESOURCES,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
J. Stuart.
Sea Grant Law Journal, State University of New York at Buffalo, Vol 1, p 165-210, 1976.

Descriptors: *Coasts, *Decision making, *Resource allocation, *Judicial decisions, *Competing uses, Governments, Administrative agencies, Cost-benefit analysis, Economics, Social aspects, Legal aspects, Adjudication procedure, Cost allocation, Methodology, Planning, Management, Resources, Resource development, Models, Legal review, Shores, Water law.
Identifiers: *Coastal areas, *Coastal resources, *Resource use disputes, Coastal lands and waters, Coastal zone management.

Coastal areas contain unique and limited resources. Consequently governments are faced with numerous divergent demands. The management of coastal lands and waters and allocation of resources has put decision-making institutions and their procedures to the test. This overview of governmental decision-making in coastal area resource allocation has two goals. The first is to evaluate institutions by their ability to carry on multi-lateral balancing processes, including the ability to define groups of compatible and incompatible uses and then articulate guidelines for the diversion of coastal resources among them. The second is to consider the actual decision making process. The occasion for coastal area allocation is usually a dispute. Disputes may be competition or conflict of values. A competing use dispute arises when two partis perceive a resource similarly, and agree on its value, but disagree over how it is to be allocated. A conflict of values dispute arises when the uses desired by the parties are so divergent that one use would completely obliterate use by the other group. The article examines both administrative and judicial decision-making, as well as the usual parties to a dispute. Models are proposed and cost-benefit analysis presented in order to make recommendations for improving coastal resource allocation decision making. (Moorhouse-Florida)
W77-05041

MODEL WATER POLLUTION STATUTE,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 5G.
W77-05042

THE WATER MANAGEMENT CONSTITUTIONAL AMENDMENT PRO: CON:,
Fla Environmental and Urban Issues, Vol III, No 3, p 8-10, 16-17 (Feb 1976).

Descriptors: *Florida, *Administration, *Taxes, *Water districts, *Financing, Water law, State governments, Legislation, Constitutional law, Legal aspects, Planning, Local governments, Governmental interrelations, Government finance, Water control, Allotments, Bond issues, Political aspects, Inter-agency cooperation, Public rights, Public benefits.
Identifiers: *Water management districts, Referendum, User fees, Property taxes, Flood control districts, Constitutional amendments.

The Water Management Constitutional Amendment passed in 1975 authorizes the levy of property taxes for water management purposes not to exceed one mill or .05 mills in northwest Florida. The adjustment of water management district boundaries to correspond with river basins in accordance with the Water Resources Act (WRA) of 1972 necessitated the Amendment. The boundary changes effectively destroyed the taxing authority of those districts previously allowed to levy taxes and required a statewide amendment to permit taxing in each district. Proponents contend that the amendment would provide each district with the fiscal capacity necessary for effective implmentation of the W.R.A., equalize tax structures through intra-district financing, solidify state-local relationships by coordinating local decision making with state review, and provide needed flexibility as to the use of funds. In contrast, the amendment's opponents argue that other alternatives such as district-wide referendums to determine local funding preferences should be considered prior to a wholesale authorization of ad valorem

taxes. Furthermore, the lower millage assessment for northwest Florida which would necessitate state aid to that district is severely criticized and urged as a ground for defeat of the amendment. (Moorhouse-Florida)
W77-05043

GROWTH WITH ENVIRONMENTAL AWARENESS,
D. W. O'Connell.
Fla Environmental and Urban Issues, Vol III, No 3, p 11-13 (Feb 1976).

Descriptors: *Florida, *Planning, *Administration, *Decision making, *Coordination, Legislation, State governments, Local governments, Administrative decisions, Administrative agencies, Comprehensive planning, Leadership, Manpower, Social aspects, Regulation, Water law, Project planning, Short-term planning, Long-term planning, Management.
Identifiers: Planning utilization, Administrative regulations.

Since the adoption of its 1968 Constitution, Florida has passed numerous environmental protection acts into law. Recently, the state has seen a proliferation of planning acts in the landscape of legislation. With an abundance of planning requirements, the problem now centers on a lack of implementation, coordination, and leadership. Uncoordinated state agencies have been unable to cope with the promulgation of regulations pursuant to recent environmental legislation. The Environmental Reorganization Act was passed in 1975 in an effort to streamline the administration of environmental legislation. The Act created the Department of Environmental Regulation and established the Environmental Regulation Commission. These two bodies are responsible for virtually all environmental regulation, standard-setting, rule-promulgation, and enforcement. This type of coordinated administration is essential to the implementation and enforcement of Florida's environmental legislation. (Moorhouse-Florida)
W77-05044

THE BALANCING OF CONVENIENCE DOCTRINE ESPECIALLY AS APPLIED TO WATER POLLUTION,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 5G.
W77-05046

FARMERS, FEEDLOTS AND FEDERALISM: THE IMPACT OF THE 1972 FEDERAL WATER POLLUTION AND CONTROL ACT AMENDMENTS ON AGRICULTURE,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 5G.
W77-05047

FLORIDA WATER AND RELATED LAND RESOURCES KISSIMMEE--EVERGLADES AREA,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4B.
W77-05048

AREAWIDE PLANNING UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972: INTERGOVERNMENTAL AND LAND USE IMPLICATIONS,
For primary bibliographic entry see Field 5G.
W77-05050

ENVIRONMENTAL LAW: FWPCAA INTERPRETED TO SUBJECT DREDGING OPERATION OF CORPS OF ENGINEERS TO STATE PERMIT PROGRAMS.
For primary bibliographic entry see Field 5G.
W77-05051

DEVELOPMENTS IN WATER QUALITY AND LAND USE PLANNING: PROBLEMS IN THE APPLICATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
For primary bibliographic entry see Field 5G.
W77-05052

THE ENTITLEMENT TO MUNICIPAL WATER SERVICE: CONSTITUTIONAL PROBLEMS IN THE DETERMINATION OF A PUBLIC UTILITY SERVICE,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
M. B. Phillips.
Urban Law Annual, Vol 9, p 285-301, (1975).

Descriptors: *Public utilities, *Water rights, *Municipal water, *Water consumption(Except consumptive use), *Suburban areas, *Legal aspects, Water law, Administrative agencies, Constitutional law, Public rights, Legal review, Judicial decisions, Law enforcement, Water demand, Social aspects, Social impact, Administration, Welfare(Economics), Third party effects, Social needs, Social values.

The federal judiciary has developed the concept of 'entitlement' to protect against termination of governmental benefits by administrative discretion. The courts as yet have not extended the concept to the status of a fundamental interest under the equal protection clause. The theoretical foundation for procedural due process requirements in terminating public utility service is grounded upon recent Supreme Court decisions. In order to determine the constitutionally required protection in termination cases, the court may balance the necessity of the service to human subsistence with the countervailing governmental interest in conserving fiscal and administrative resources. In order for a termination to be constitutionally valid the following requisite for pre-termination procedure should be followed: (1) notice and reason for the proposed termination; (2) opportunity to defend, including confrontation of any adverse witnesses, and presentation of arguments; (3) oral statement of position; (4) representation by counsel if desired; (5) impartial decision maker; and (6) decision that sets forth evidence relied upon and reasons for the result. (Welch-Florida)
W77-05053

SELECTED ENVIRONMENTAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
R. L. Manley, and J. J. Peterson.
North Dakota Law Review Vol 50, No 2, p 329-358 (Winter 1974).

Descriptors: *Encroachment, *Irrigation effects, *Saline water intrusion, *Canada, Judicial decisions, Administrative agencies, State governments, Federal government, Federal project policy, Water distribution(Applied), Legal aspects, International law, Legal review, Water pollution sources, Irrigation water, Water rights, Irrigation programs, Citizen suits, Projects, Treaties, Governmental interrelations, Irrigation systems, Distribution systems, Environmental effects.
Identifiers: *National Environmental Policy Act, *Garrison Diversion Project.

Serious questions have been raised as to the possibility of salinization by the Garrison Diversion Project irrigation waters. In response, the Bureau of Reclamation has indicated that the project's plans include measures to avoid this difficulty. Current indications are that the project will not be stunted through action in the political arena. However, various national and international fears may prompt efforts to halt the project. Canada's concern over downstream salinization of land areas has created international implications which must be negotiated. In addition to these complications, the project may be subject to judicial review under the National Environmental Policy Act. Both procedural and substantive issues are involved. The former will focus on the adequacy of the environmental impact statement. The latter concerns the requirement of substantive judicial review of agency decisions under the National Environmental Policy Act. The review will examine whether the agency decision was based on attempts to reach an optimally beneficial decision. Thus, international complications surrounding the project and questions as to the project's ability to withstand the judicial scrutiny of substantive review indicate a prognosis which, if not cirtical, is at least serious. (Rieck-Florida)
W77-05054

BUREAUCRATIC SUPPLY AND LEGISLATIVE DEMAND: IMPLICATIONS FOR WATER RESOURCES PLANNING,
California Univ., Berkeley. Graduate School of Public Policy.
For primary bibliographic entry see Field 6B.
W77-05055

LEGISLATIVE DEVELOPMENTS--DEEPWATER PORT ACT OF 1974,
A. W. Stephenson.
Law and Policy in International Business, Vol 7, No 4, p 1271-85 (Fall 1975).

Descriptors: *Oil, *Transportation, *Structures, *Oceans, *Coastal structures, Coasts, International law, Ships, Oil spills, Pipelines, Permits, Navigation, State governments, Federal government, Governmental interrelations, Regulation, Damages, State jurisdiction, Continental shelf, Foreign countries, Legislation, Oil pollution, Environmental control, Legal aspects.
Identifiers: *Deepwater Port Act of 1974, *Deepwater ports, *Super tankers, Marine terminals, Licenses, Public hearings, Liability, Certification, Environmental impact statement.

By 1985 the United States will import approximately 13 million barrels of crude oil per day by sea. It is estimated that the use of very large crude carriers (VLCC's) to transport the oil rather than smaller tankers would save $1.5 billion in shipping costs in 1985, and could reduce oil spills by more than 90% over a 20-year period. Since there are no ports in the United States deep enough to accommodate VLCC's, in 1974 Congress passed the Deepwater Port Act to encourage construction of such ports. The author discusses the major provisions of the Act including licensing, state veto power, environmental provisions, and liability. Legal problems which are not covered adequately by the Act involve the international legal status of deepwater ports, state-federal interactions in port licensing and regulation, and possible antitrust violations. In addition, adequate environmental safeguards seem to be lacking from the Act. Effective environmental regulation will probably require international cooperation. (Capehart-Florida)
W77-05056

IN-STREAM APPROPRIATION FOR RECREATION AND SCENIC BEAUTY (COMMENT ON IDAHO DEPARTMENT OF PARKS V IDAHO DEPARTMENT OF WATER ADMINISTRATION),
S. W. Welsh.
Idaho Law Review, Vol 12, No 2, p 263-275 (Spring 1976).

Descriptors: *Idaho, *Appropriation, *Beneficial use, *Recreation, Aesthetics, Legislation, Springs, Administrative agencies, Permits, Water rights, Diversion, Non-consumptive use, Judicial decisions, Canyons, Prior appropriation, Unappropriated water, Water utilization, Conservation,

Scenery, Parks, Natural resources, Running waters.
Identifiers: Public trust doctrine.

The Idaho Department of Parks filed a permit application to preserve the unappropriated waters of Malad Canyon for scenic beauty and recreational use as authorized by the Idaho legislature. The Department of Water Administration denied the permit because there was to be no actual physical diversion of the waters. The district court ordered issuance of the permit finding that a valid appropriation can be made without actual diversion. The Idaho Supreme Court affirmed the district court's opinion. A case comment analyzes the Supreme Court opinion, noting first that this appropriation is for a non-consumptive use, and does not restrict potential appropriators downstream from the canyon. The question of whether recreation and scenic beauty quality as beneficial uses is examined. The Supreme Court decision may leave room for a subsequent decision that other more urgent needs can replace the scenic beauty and recreation uses. After examining the court's opinion on the diversion requirement of the appropriation doctrine, the author suggests the possibility of eliminating the requirement completely. (Capehart-Florida)
W77-05057

OREGON COASTAL ZONE LAND: USE, OWNERSHIP, AND VALUE CHANGE,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
For primary bibliographic entry see Field 6B.
W77-05058

COASTAL ZONE MANAGEMENT AND INTERGOVERNMENTAL COORDINATION,
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
M. J. Hershman.
For sale by National Technical Information Service, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, Va. 22161, as PB-248 440. 1975, 20 p. Reprint from Oregon Law Review, Vol 54, No. 1, 1975, p. 13-33.

Descriptors: *Legislation, *Coasts, *Land use, *Governmental interrelations, *Comprehensive planning, Land resources, Water resources, State governments, Federal government, Local governments, Long-term planning, Navigable waters, Erosion, Powerplants, Oil spills, Administrative agencies, Political aspects, Rivers and Harbors Act.
Identifiers: *Coastal zone management, Coastal Zone Management Act of 1972, Oil spill clean-up.

Conflicts arising in the coastal zones between land-oriented developments and water-oriented activities are difficult for governmental agencies to resolve since there is no single agency with authority over both land and water resource decisions. The Coastal Zone Management Act of 1972 was passed to encourage comprehensive planning by coastal states for their coastal areas. Under the Act, coordination of federal activities with state management programs is necessary for approval of state programs. Federal laws which may overlap with the objectives of coastal zone management include the 1899 Rivers and Harbors Act, the Fish and Wildlife Coordination Act, the 1973 Flood Disaster Act, the 1972 Rural Development Act, the Federal Water Pollution Control Act, the National Environmental Policy Act, the 1975 Deepwater Port Act, the Shoreline Erosion Control Demonstration Act, and the Power Plant Siting Act. The author cites examples of state-federal conflicts in coastal zone management and suggests that interagency coordination is essential for a strong coastal zone management program. (Capehart-Florida)
W77-05059

THE INTERNATIONAL SEABED AND THE SINGLE NEGOTIATING TEXT,
University of Wales Inst. of Science and Technology, Cardiff.
A. V. Lowe.
San Diego Law Review, Vol 13, p 489-532 (1976).

Descriptors: *Coasts, *Mining, *Law of the sea, *United Nations, *International law, Exploration, Continental shelf, Legal aspects, United States, Cost-benefit analysis, Development, International waters, Conferences, Economics, Ownership of beds.
Identifiers: *Coastal waters, *Economic zones(Seas).

The United Nations Conference on the Law of the Sea has been the forum for negotiations on the division of sea and seabed resources. The author details both the year-by-year history and the political motivations which will eventually lead to a resolution of resource allocation questions. The world's developed nations seem unwilling to put seabed areas under international control, as such an action would lead to loss of economic hegemony. Developing nations, however, must adopt a moderate line both to insure effective implementation and to avoid threats of withdrawal from the Conference. Thus the emergence of an effective seabed authority may be possible, but only if progress toward compromise solutions continues. (Frank-Florida)
W77-05060

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NPDES PROGRAM: APPLICATION OF PERMIT PROGRAM TO AGRICULTURAL ACTIVITIES,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 134, p 28493-97, July 12, 1976.

Descriptors: *Agriculture, Water pollution sources, *Water pollution, *Surface waters, Surface runoff, Irrigation water, Irrigation, Water pollution control, Agricultural runoff, Agricultural watersheds, Farms, Fertilizers, Forages, Water permits, Irrigation permits, Irrigated land, Return flow, Salinity, Legal aspects, Permits, Administrative agencies, Regulation.
Identifiers: *FWPCA Amendments of 1972, *Nonpoint sources(Pollution), *National Pollutant Discharge Elimination System (NPDES), *Point sources(Pollution).

The Environmental Protection Agency (EPA) proposed regulations for applying the National Pollutant Discharge Elimination System (NPDES) permit program to agricultural activities. The regulations clarify NPDES jurisdiction over discharges of agricultural pollutants by defining which sources of pollutants are point sources, since only point sources are subject to the permit system. Although some assert that the program should be more comprehensive, legal and legislative history seems to limit the program to point source pollution. Point sources in the agricultural activities category are conveyances from which irrigation return flow is discharged as a result of the controlled application of water by any person. Regulation 124.84(2) defines irrigation return flow as surface water containing pollutants which result from the controlled application of water by any person to land used primarily for crops, forage growth, or nursery operations. Critics of the regulations predict costly administration without commensurate benefits. Proponents disagree, arguing that no uniform monitoring requirements will be imposed. The major criticism of the rules is the arbitrary distinction made between dry land and irrigated farming with only the latter being subject to regulation. Numerous alternative bases for determining point and nonpoint sources are reviewed. (Moorhouse-Florida)
W77-05061

PAVING AND ROOFING MATERIALS (TARS AND ASPHALT), POINT SOURCE CATEGORY PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-05062

CORWINE V CROW WING COUNTY (COMMERCIAL CAMPGROUNDS DETRIMENTAL TO SMALL LAKES),
244 NW2d 482-91 (Minn 1976).

Descriptors: *Minnesota, *Zoning, *Lakes, *Camp sites, *Judicial decisions, State governments, Administrative agencies, Permits, Legal aspects, Regulation, Land use, Local governments, Water law, Recreation facilities, Camping, Social aspects, Riparian rights, Reasonable use, Recreation, Relative rights, Remedies, Waste disposal, Administrative decisions.
Identifiers: Crow Wing County(Minn), *Nokay Lake(Minn).

Plaintiff-riparian landowner had developed his land along a lake to be used as a commercial campground. Defendants are the county in which the lake is situated, and other riparian owners on the lake who claim the campgound will have severe detrimental effects. the zoning commission denied a campground operating permit to the plaintiff. Plaintiff appealed. The district court reversed the zoning commission's ruling, and granted a summary judgment, stating that as long as no findings of fact were attached to the zoning commission's permit refusal order, the ruling was per se arbitrary and void. The Supreme Court disagreed with this reasoning and stated that the district court should have considered the reasons for denial which were advanced by the zoning commission. The Court pointed out that such a campground would increase the lake's population to an intolerable level. In addition, sanitation facilities were inadequate, and pollution of the lake might result. The Court concluded that a summary judgment should not have been granted by the district court because genuine issues of fact did indeed exist. A new trial was ordered. (Moorhouse-Florida)
W77-05063

HAYES V YOUNT (APPELLATE REVIEW OF COASTAL DEVELOPMENT PERMIT),
552 P2d 1038-48 (Wash 1976).

Descriptors: *Coastal marshes, *Landfills, *Permits, *Administrative decisions, *Washington, Legal review, Legislation, Land development, Administrative agencies, Coastal structures, Solid wastes, Regulation, State governments, Local governments, Comprehensive planning, Water zoning, Judicial decisions.
Identifiers: *Coastal waters, Fill permits.

Plaintiff landowner sought reinstatement of development permit to allow filling of wetlands in an estuary. Plaintiff owned land bordering Puget Sound, consisting largely of unimproved saltwater marsh. Application was made to operate a solid waste landfill and expand shipping and heavy industrial use capabilities, describing the development as a marine industrial area. The county granted the permit, the Shorelines Hearings Board vacated it, the trial court reinstated the permit, and state appealed. The appellate court upheld the Board's finding that the insignificant environmental effect of a permit was irrelevant when an aggregation of similar permits would have significant effects. The court declined to reverse the Board's finding that solid wastes could not be used for fill in a coastal area, regardless of the absence of a showing that the landfill would have a deleterious effect on adjacent waters. Plaintiff did not describe the proposed use of the land in sufficient detail to benefit from a policy favoring uses which are inique to, or dependant upon, use of the state's

shoreline. The permit was vacated for further consideration at the county level. (Molloy-Florida)
W77-05064

AUTHORITY OF SECRETARY OF ARMY TO DENY DREDGING AND FILLING PERMIT FOR ECOLOGICAL REASONS UNDER SECTION 10 OF RIVERS AND HARBORS ACT OF 1899, 33 USCS SECTION 403,
D. E. Feld.
25 ALR Fed 706-14 (1975).

Descriptors: *Dredging, *Permits, *Ecology, *Legislation, *Rivers and Harbors Act, Administrative agencies, Ecosystems, Environment, Environmental effects, Wildlife, Conservation, Navigation, Water supply, Water quality, Wildlife conservation, Fish conservation, Adoption of practices, Navigable rivers, Rivers, Navigable waters, Water policy, Judicial decisions, Legal review, Legal aspects.
Identifiers: *National Environmental Policy Act, Wildlife Coordination Act, Secretary of the Army, Secretary of the Interior, Navigation obstructions.

Since the enactment of the Rivers and Harbors Act of 1899, the Secretary of the Army had denied dredge permits only if such dredging unreasonably blocked navigable waters. However, in 1967 the Secretary of the Army signed a Memorandum of Understanding with the Secretary of the Interior and agreed to consider ecological factors in determining whether or not to grant a dredging permit. Since then, factors that have been relevant to such a decision include: conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife, flood damage prevention, land use classifications, navigation, recreation, water supply, water quality, and the needs and welfare of the people. The Secretary of the Army's right to deny a dredging permit based on ecological grounds has been upheld in the landmark case of Zabel v. Tabb 430 F2d 199 (5th Cir 1970). The court admitted that ecological concerns were not specifically mentioned in the statute as grounds for a dredging permit denial. However, when the statute is read in conjunction with the National Environmental Policy Act of 1969 and the Fish and Wildlife Coordination Act, there is no doubt that the Secretrary is meant to consider ecological factors. Following Zabel v. Tabb, a flood of cases in numerous federal courts have reached the same conclusion. (Moorhouse-Florida)
W77-05065

CAPPAERT V UNITED STATES (RESERVATION OF UNAPPROPRIATED APPURTENANT WATER RIGHTS WHEN FEDERAL GOVERNMENT WITHDRAWS LAND FROM PUBLIC DOMAIN),
96 S Ct 2062-74 (1976).

Descriptors: *Water levels, *Reservation doctrine, *Unappropriated water, *Public lands, *Adjacent land owners, Federal jurisdiction, Federal reservations, Federal-state water rights conflicts, Jurisdiction, Water rights, Legal aspects, Judicial decisions, Prior appropriation, Water level fluctuations, Water wells, Water management(Applied), National Scientific Reserves, Constitutional law, Water law.
Identifiers: *Injunctive relief.

The United States brought action against defendant landowners for a declaration of rights, seeking to limit defendants' pumping groundwater on their ranch since the source of the water was an underground basin which is also the source of the water in Devil's Hole Death Valley National Monument. Defendants' pumping caused the water level in Devil's Hole to drop, thereby decreasing the ability of a certain species of fish to spawn in sufficient quantities to prevent extinction. Plaintiff contends that a 1952 Presedental Proclamation reserving Devil's Hole as a national monument also reserved water rights in unappropriated appurtenant water sufficient to maintain the level of the underground pool. The Superme Court held that determination of reserved water rights was not governed by state law. Since the proclamation expressed an intention to reserve unappropriated water, and at time the water was unappropriated, the United States could protect its water from subsequent diversion by adjacent landowners. The court relied on the implied reservation of water doctrine since it is based on the necessity of water for the purpose of the federal reservation. Therefore the pool need only be preserved, consistent with the intention expressed in the 1952 Proclamation, to the extend necessary to preserve its scientific interest in the fish. (Welch-Florida)
W77-05066

ENVIRONMENTAL PROTECTION AGENCY V CALIFORNIA EX REL STATE WATER RESOURCES CONTROL BOARD (PERMIT REQUIREMENTS OF FEDERAL INSTALLATION DISCHARGING WATER POLLUTANTS),
96 S Ct 2022-35 (1976).

Descriptors: *Federal Water Pollution Control Act, *California, *Washington, *Water pollution control, *Water quality standards, Water quality control, Water quality, Water permits, Water pollution sources, Water resources, Water conservation, Waste disposal, Waste water(Pollution), Water law, Administrative decisions, Federal government, Federal jurisdiction, Federal-state water rights conflicts.
Identifiers: *FWPCA Amendments of 1972, *Administrative regulations.

Plaintiff states brought this action against defendant Environmental Protection Agency (EPA) to determine whether federal installations discharging pollutants in a state's water with a federally approved permit program, under the Federal Water Pollution Control Act Amendments of 1972, must secure their permits from the state or from EPA. Plaintiffs contend that under the Act states participating in approved National Pollutant Discharge Elimination System (NPDES) permit programs can require federal dischargers within the state's jurisdiction to obtain state rather than EPA permits, and the EPA has no authority to suspend operation of a state's permit program only for nonfederal dischargers. The Supreme Court held that federal installations are subject to state regulation only when, and to the extent that, congressional authorization is clear and unambiguous. Federal installations must comply with the Act's requirements conerning state control and abatement of pollution, but obtaining a permit from a state with a federally approved program is not one of the requirements even though such dischargers may be required to comply with stricter discharge standards established by the state. (Welch-Florida)
W77-05067

COASTAL ZONE MANAGEMENT ACT AMENDMENTS OF 1976,
Pub. L. No. 94-370, secs 2 thru 15, 90 Stat 1013-33.

Descriptors: *Governmental interrelations, *Legislation, *State governments, *Coasts, Project planning, Planning, Zoning, Coastal structures, Offshore platforms, Oceans, Permits, Federal-state water rights conflicts, Public access, Water law, Administration, Management, Grants, Research and Development.
Identifiers: *Coastal zone management, *Coastal Zone Management Act Amendments of 1976, Coastal waters, Administrative regulations.

Both minor grammatical changes and major additions characterize the 1976 amendments to the Coastal Zone Management Act of 1972. The amendments are predominantly concerned with the interrrelationship between expanded energy activity and the coastal zone. New definitions include coastal energy activity, energy facilities, and outer Continental Shelf energy activity. Section 305 concerning management program development grants is completely revised. The new section sets out the requirements essential to every such program, the standards of eligibility for such grants, and the amounts available under the section. Section 306 pertaining to administrative grants is similarly revised. Section 307 amended to provide that the federal government shall authorize no Outer Continental Shelf exploration or development until it is first approved as consistent with the affected coastal state's management program. Sections 308 entitled 'Coastal Energy Impact Program' is new and provides financial assistance for specified energy development activities. A Coastal Energy Impact Fund is established in the U.S. Treasury. Section 309 and 310 are likewise new provisions. 309 encourages interstate cooperation and provides for interstate grants. Section 310 authorizes research and training progrms at the state level and orders federal cooperation with these programs. (Moorhouse-Florida)
W77-05068

COASTAL ZONE MANAGEMENT (GOALS AND GUIDELINES),
Hawaii Rev Stat secs 205A-1 thru -32 (Supp 1975).

Descriptors: *Hawaii, *Legislation, *Coasts, *Beaches, *Coastal structures, Shores, Sea walls, Coastal engineering, Permits, Planning, Water law, Local governments, Project planning, Public access, Recreation, Wildlife management, Environental effects.
Identifiers: *Coastal Zone Management Act of 1972, *Coastal zone management, Coastal waters.

The department of planning and economic development is herein authorized and directed to develop a coastal zone management program in compliance with the federal Coastal Zone Management Act. State policy in the interim shall be to preserve, protect, and wherever possible to restore the natural resources of the coastal zone of Hawaii. Special management areas consisting of land extending not less than one hundred yards inland from the shoreline are designated for the purpose of maintaining, restoring and enhancing the coastal zone environment and to provide adequate public access to public beaches and recreation areas. Specific guidelines for the review of proposed developments in such management areas were provided to facilitate implementation of area objectives. These guidelines include: (1) preservation of adequate access to public beaches, recration areas, and natural reserves; 82) reservation of adequate wildlife preserves and recreation areas; (3) adequacy of provisions for waste treatment; and (4) extent of land form alteration and effects on water resources. Furthermore any development with a substantial adverse ecological effect not outweighed by public health and safety shall not be approved, and alteration of any body of water or beach or access to either shall be minimized. A permit system is established to assure compliance. (Moorhouse-Florida)
W77-05069

ACQUISITION OF WATER RIGHTS.
Wyo Const art 13 sec 5.

Descriptors: *Wyoming, *Water rights, *Water allocation(Policy), *Preferences(Water rights), Water distribution(Applied), Legal aspects, Legislation, Administration, Competing uses, Supply, Water supply, Water demand, Water control, Water management(Applied), Eminent domain, Prior appropriation, Jurisdiction, Municipal water, Cities, Compensation, Water law.

Municipal corporations in Wyoming shall have the same right as individuals to acquire rights to the use of water for domestic and municipal purposes. The legislature shall provide for the exercise of the

right of eminent domain by incorporated cities, towns, and villages to acquire water from prior appropriators. The amount of water thus acquired shall be that which is necessary for well being, and for domestic uses. Any prior appropriations acquired by eminent domain shall receive just compensation. (Cowart-Florida)
W77-05070

SEWAGE DRAINS AND DISCHARGE; REFUSE DISPOSAL.
Wis Stat Ann secs 144.045 thru 144.05 (1974).

Descriptors: *Wisconsin, *Waste disposal, *Sewage disposal, *Sewage treatment, Sewage effluents, Regulation, Construction, Legislation, Water pollution control, State governments, Environmental effects, Treatment facilities, Floodwater, Natural resources, Wastes, Planning, Cities, Lakes.

The outflow or effluent from any sewage system may be discharged into any stream or drain, however, sewage may not be discharged into certain lakes. If the lake is located within 18 miles of the system or plant of a city or town haveing a population of 240,000 or more, and the lake has more than 2 square miles and less than 16 square miles in area, and a drainage basin draws into such lake, then no outflow of untreated sewage may be discharged into such lake. Any owner of an existing or new plant may file with the department plans for advanced treatment of effluent, as in the judgment of the department will accomplish substantially the same results in eliminating nuisance conditions on such lakes, in order to obtain exemptions from the foregoing provisions. Penalties are provided for any person violating this subsection. (Martin-Florida)
W77-05071

CANAL COMMISSION LAW.
Wash Rev Code Ann secs 91.12.010 thru .060 (Supp 1975).

Descriptors: *Washington, *Navigation, *Project feasibility, *Canals, *Legislation, Recreation, Facilities, Governmental interrelations, Federal government, Governments, Eminent domain, Condemnation, Real property, Right-of-way, Easements, Administrative agencies, Construction, Excavation, Channels, Canal construction, Feasibility studies.
Identifiers: Public hearings.

In order to aid commerce and navigation and to develop related relation facilities, the state of Washington has enacted legislation creating a canal commission. The commission, which is responsible for developing navigation canals within the state, shall make feasibility studies of canals and canal systems. After a public hearing the commission may construct, maintain and operate any canal it deems feasible. The commission has the power to acquire land for canal purposes by gift, purchase, or condemnation. The commission has the authority to cooperate with the federal government so as to persuade the federal government to take over any canal project at any stage. The commission is further empowered to cooperate with the federal government in any federal canal project. (Capehart-Florida)
W77-05072

UPPER WEST FORK RIVER WATERSHED V CORPS OF ENGINEERS (CONSTRUING AN ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED DAM PROJECT).
414 F Supp 908-32 (ND W VA 1976).

Descriptors: *Flood control, *Reservoirs, *Watershed management, *Federal government, Water resources development, Recreation, Administrative agencies, Legal review, Basins, Rivers, West Virginia, Dams, Flood plains, Eminent domain, Lakes, Judicial decisions.
Identifiers: *Environmental Impact Statement(EIS).

Plaintiff, a West Virginia cooperation, sought to enjoin completion of a dam and lake project under construction by the U.S. Army Corps of Encineers, until deficiencies in the environmental impact statement (EIS) were cured. Plaintiff corporation is composed primarily of landowners; the express purpose of the group is to encourage a watershed project in the area and thus avoid losing the lands of its members through eminent domain proceedings. The project, designed for flood control and other purposes, would create a lake of 3,470 acres when at full pool. Plaintiff landowner association attacked the EIS for failure to consider a watershed program as an alternative. The court determined that the standard for judicial review of the informed agency action was that the action must not be arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law. The court found that the Corps had considered and rejected watershed programs. In the absence of any showing of the feasibility of a watershed program by the plaintiff, the action must fail on defendant's motion for a summary judgment. Plaintiff's allegations regarding term benefits, public involvement in the EIS, and commitments of resources were likewise disposed by the court. (Moorhouse-Florida)
W77-05073

STATE V LUCIUS (SABINE RIVER AUTHORITY REGULATION OF ACCESS BY WATER TO LAKE).
335 So2d 95-102 (La Ct App 1976).

Descriptors: *Louisiana, *Roads, *Public access, *Inlets(Waterways), Reservoirs, Damages, Dams, Impoundments, Land tenure, Leases, Road construction, Permits, Culverts, Dredging, Administrative agencies, State governments, Judicial decisions, Legal aspects, Navigable waters, Ravines.
Identifiers: *Navigation obstructions, Injunctive relief.

Plaintiff state agency sought to enjoin defendant property owner from using, and to require removal of, a roadway constructed by the defendant across the arm of a reservoir. The defendant's property, which abutted the reservoir, was divided by a ravine which had become an arm of the reservoir so that direct travel from one side of his property to the other was impsossible. The defendant constructed a road across the ravine installing a culvert to allow the flow of water in the inlet. The road blocked access to the reservoir for property owners further up the ravine. The defendant contended that such construction was proper since he had obtained a verbal permit. The trial court ordered the defendant to remove the roadway or pay the cost of removal by the plaintiff. The Third Circuit Court of Appeals of Louisiana affirmed saying that at the time the defendant claimed authorization under a verbal permit, a procedure for written permits had been instituted so that a verbal permit was ineffective. (Capehart-Florida)
W77-05074

DESORMEAUX V CENTRAL INDUSTRIES, INC. (LACK OF WATER FOR IRRIGATION CAUSING CROP DAMAGE),
333 So2d 431-35 (La Ct App 1976).

Descriptors: *Louisiana, *Irrigation, *Culverts, *Negligence, Rice, Roads, Damages, Accidents, Conveyance structures, Irrigation canals, Irrigation water, Irrigation systems, Grains(Crops), Field crops, Flood irrigation, Flooding, Agriculture, Contracts, Legal aspects, Judicial decisions.

Plaintiff farmer sought damages from defendant contractor for the partial loss of his rice crop. The plaintiff irrigated his rice fields with water furnished under a contract with his father. The water was supplied through a concrete culvert which ran under a road. The defendant negligently broke the culvert while digging a trench along the road. Because of the broken culvert, the plaintiff was unable to flood his rice field thus causing a substantial reduction in the rice yield. The trial court dismissed the suit holding that the plaintiff had no right of action. The Third Circuit Court of Appeals of Louisiana held that the plaintiff had a right of action but no cause of action against this particular defendant. The court stated that the proper remedy for the plaintiff was to bring suit against his father for failure to supply water under the irrigation contract. The father could then have sued the contractor for damages to the culvert. (Capehart-Florida)
W77-05075

THE CONSERVANCY ACT OF NEW MEXICO (CREATION AND POWERS OF CONSERVANCY DISTRICTS),
N M Stat Ann secs 75-28-1 thru -4 (1968).

Descriptors: *New Mexico, *Water districts, *Legislation, *Water control, *Public health, Governments, State governments, Legal aspects, Planning, Regulation, Water resources development, Drainage systems, Utilities, Water allocation(Policy), Water distribution(Applied), Water policy, Construction, Financing, Bond issues, Irrigation, Streams, Reservoirs.

Conservancy districts for the state of New Mexico are herein created by the conservancy court to prevent floods, regulate stream channels, regulate stream flow, control watercourses, fill wet and overflowed lands, provide for irrigation and protect property from innundation. The conservancy district bonds may be issued hereunder. This statute allows organization of districts for the purpose of providing water control, and construction and maintenance of distribution systems. Nothing in the statute though shall apply to or affect irrigation or drainage districts heretofore organized under any laws of the state. The conservancy districts have wide powers to enable them to accomplish their purposes: diverting and widening streams, constructing reservoirs, canals, irrigation ditches as well as bridges and dams. Conservancy district powers extend so far as to allow construction, operation and control of plants for the sale and use of electric energy. The districts may levy assessments, issue bonds and make appropriation of money. (Welch-Florida)
W77-05076

6F. Nonstructural Alternatives

FLOOD DAMAGE MITIGATION.
Simulation Network Newsletter, (Hydrocomp), Vol 8, No 6, p 1-18, October, 1976. 3 fig, 5 ref.

Descriptors: Analytical techniques, *Floods, *Flood damage, *Flood protection, *Flood control, Probability, Diversion structures, Reservoirs.

Methods and techniques for assessing flood damage probability and constructing flood control structures and procedures are reviewed. Structural techniques such as reservoirs, levees, and diversions to reroute flood waters away from the flood area were used. Flood proofing is a recent development. Minimizing total costs of flooding is the best criteria for determining control means in a given situation. Evaluation of the flood area and probability and magnitude of flooding is the first consideration. An analysis of a hundred year flood record requires a 115 year study for a plus or minus 10% accuracy. Because most streamflow records are shorter than 48 years, simulation must be used to project conditions further back. A relationship should be developed between flood damage and river stage or flow to determine the relationship of flood damage and frequency. Flood plain mapping is another tool which is necessary to develop the most adequate and pertinent flood

control plan. This helps to ensure the most economic and beneficial flood control measures. Flood forecasting is valuable in providing time to issue warnings to populations as well as allowing for adequate preparation for the most efficient use of flood control plans. Such forecasts must include data collection of current information on rainfall and upstream river stages, hydrologic techniques which translate this data to streamflow at downstream points where warnings are necessary, and a program for disseminating the forecasts and warnings. Forecasting is also an aid in the development of control measures which must handle a particular flood period. The Hydrocomp company has several services, including simulation programming, to assist these developments. (Collins-FIRL)
W77-04724

FLOOD CONTROL REGULATIONS; MARSHALL FORD DAM AND RESERVOIR, COLORADO RIVER, TEXAS,
Corps of Engineers, Washington, D.C.
Federal Register, Vol. 41, No. 70, p. 15005-8, April 9, 1976.

Descriptors: *Texas, *Flood control, *Dams, *Regulations, Reservoirs, Federal government, Insurance, Forecasting, Rainfall-runoff relationships, Water rights, Administrative agencies, Floods, Flood protection, Structures, Flow control, Water control, Engineering structures, Hydroelectric power, Water levels, Gaging stations, Reservoir storage.
Identifiers: *Marshall Ford Reservoir, Federal flood insurance program, Energy conservation, Administrative regulations, *Colorado River(Tex).

The Corps of Engineers has promulgated final interim regulations prescribing the use of flood control storage in the Marshll Ford Reservoir on the Colorado River and the operation of the Marshall Ford Dam for flood control purposes. Project releases are to be coordinated so that the Colorado River will remain below flood stages at the downstream gaging stations. Control stages are specified for the Austin, Bastrop and Columbia gaging stations. The minimum total releases from the project are specified for given lake elevations. A summary of comments from interested parties is included. The final interim regulation contains revisions which reflect applicable comments. (Capehart-Florida)
W77-04924

JEFFERSON COUNTY V JOHNSON (COMPREHENSIVE LAND MANAGEMENT AND USE PROGRAM IN FLOOD-PRONE AREAS ACT),
For primary bibliographic entry see Field 6E.
W77-04931

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 5-6, 1974,
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 6B.
W77-05029

TITLE, JUS PUBLICUM, AND THE PUBLIC TRUST: AN HISTORICAL ANALYSIS,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 6E.
W77-05038

TOWARD THE TRUE MEANING OF THE PUBLIC TRUST,
State Univ. of New York at Buffalo. Faculty of Law and Jurisprudence.
For primary bibliographic entry see Field 6E.
W77-05039

DEVELOPMENTS IN WATER QUALITY AND LAND USE PLANNING: PROBLEMS IN THE APPLICATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
American Bar Association, Washington, D. C. Advisory Commission on Housing and Urban Growth.
For primary bibliographic entry see Field 5G.
W77-05052

6G. Ecologic Impact Of Water Development

THE SWEDISH EXPERIENCE IN CONNECTION WITH ENVIRONMENT PROTECTION AT ANIMAL PRODUCTION SITES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 5G.
W77-04614

LARGE-SCALE MANAGEMENT SYSTEMS AND ENVIRONMENTAL PROTECTION,
Wyzsza Szkola Rolnicza, Wroclaw (Poland).
For primary bibliographic entry see Field 5G.
W77-04623

AN EVALUATION OF LAND TREATMENT OF MUNICIPAL WASTE WATER AND PHYSICAL SITING OF FACILITY INSTALLATIONS,
Office of the Chief of Engineers (Army), Washington, D. C.
For primary bibliographic entry see Field 5D.
W77-04635

ENVIRONMENTAL IMPACT OF URBAN STORMWATER RUNOFF,
American Society of Civil Engineers, New York. Urban Water Resources Research Program.
For primary bibliographic entry see Field 5B.
W77-04731

POTENTIAL EFFECTS OF OIL PRODUCTION ON GEORGES BANK COMMUNITIES: A REVIEW OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR OUTER CONTINENTAL SHELF OIL AND GAS LEASE SALE NO. 42,
Woods Hole Oceanographic Institution, Mass. Seminar in Biological Oceanography.
M. S. Connor, and R. W. Howarth.
Technical Report No. WHOI-77-1, January 1977. 50 p, 2 tab, 57 ref. SG-04-6-158-44106.

Descriptors: *Resources development, *Environmental effects, *Oil pollution, *Water pollution effects, Ecology, *Oil spills, Leases, Oil industry, Gas, Pollutant identification, Toxicity, Continental Shelf.
Identifiers: *Outer Continental Shelf, Environmental impact, *Georges Bank.

The biological section of the Draft Environmental Statement for Outer Continental Shelf lease sale No. 42 has been reviewed. It has been found to insufficiently address several topics, most importantly sub-lethal changes in community structure and function, the accumulation and persistence of oil and recovery times. (NOAA)
W77-04834

WASTE DISPOSAL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5E.
W77-04847

THE PUBLIC TRUST DOCTRINE: A VIABLE APPROACH TO INTERNATIONAL ENVIRONMENTAL PROTECTION,
Denver Univ., Colo. International Legal Studies Program.
For primary bibliographic entry see Field 6E.
W77-04853

ENVIRONMENTAL QUALITY STANDARDS UNDER CONDITIONS OF UNCERTAINTY,
Guelph Univ. (Ontario). Dept. of Economics.
B. A. Forster.
Discussion Paper No. 76-7, 1976. 9 p. 4 ref.

Descriptors: *Pollution abatement, *Decision making, *Risks, *Water quality standards, Administration, Mathematical studies, Optimization, *Standards, Environment.

The question of pollution control under conditions of uncertainty is examined to determine whether environmental policy makers should modify the decision rules relating to the desirability of achieving environmental standards that would be followed in a world of uncertainty. Three cases are developed: (1) that of an economy in which the structural relationships between economic activity and the generation of pollution are deterministic and known with certainty, (2) that of an optimizing procedure for environmental authorities when the efficacy of control measures is known with certainty but the level of waste generation is not known with certainty, and (3) that of the situation in which there is uncertainty with respect to both the level of waste generation and the efficacy of pollution control measures. Results indicate that in general, if the level of waste generation and the control effectiveness are subject to uncertainty, then the decision maker needs to adjust his deterministic rules. It may not be optimal to aim at achieving the environmental standard at all. (Luedtke-Wisconsin)
W77-04858

THE BIOLOGICAL IMPORTANCE OF A POLLUTED ESTUARY,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W77-04860

ENVIRONMENTAL LAW--WATER POLLUTION--EPA ADMINISTRATOR IS EMPOWERED TO PROMULGATE EFFLUENT LIMITATIONS--AMERICAN IRON AND STEEL V EPA, 526 F2D 1027 (3D CIR 1975),
For primary bibliographic entry see Field 5G.
W77-04903

THE TRANS-ALASKA PIPELINE AND STRICT LIABILITY FOR OIL POLLUTION DAMAGE,
Washington Univ., St. Louis, Mo. School of Law.
For primary bibliographic entry see Field 5G.
W77-04907

PUBLIC PATRIMONY: AN APPRAISAL OF LEGISLATION AND COMMON LAW PROTECTING RECREATIONAL VALUES IN OREGON'S STATE-OWNED LANDS AND WATERS,
Oregon Joint Interim Committee on Environment, Agricultural and Natural Resources, Salem.
For primary bibliographic entry see Field 6E.
W77-04910

TIME BOMB IN THE MEDITERRANEAN,
For primary bibliographic entry see Field 5G.
W77-04919

TOWARD A NATIONAL OCEAN POLICY: 1976 AND BEYOND,
Johns Hopkins Univ., Ocean Policy Project, Washington, D.C.

For primary bibliographic entry see Field 6E.
W77-04920

JURISDICTION AND GROUNDS FOR DENIAL BY STATE AND FEDERAL AGENCIES OF DREDGE AND FILL OPERATIONS,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 5G.
W77-04923

EFFECTS OF ENERGY-RELATED ACTIVITIES ON THE ATLANTIC CONTINENTAL SHELF,
Brookhaven National Lab., Upton, N. Y.
Proceedings of Conference held at Brookhaven National Laboratory, Upton, NY on November 10-12, 1975, June 1976. Also as BNL-50484. 266 p. Manowitz, B. (Ed.). ERDA Contract E(30-1)-16.

Descriptors: *Environmental effects, *Resources development, *Baseline studies, *Oil industry, *Powerplants, *Ecosystems, *Oil spills, *Oil pollution, *Toxicity, Oceanography, Geology, Biology, Ocean currents, Tidal effects, Dispersion, Benthos, Fisheries, Sediment tansport, Plankton, Continental shelf.
Identifiers: *Outer Continentl Shelf, *Energy resources, Middle Atlantic Bight, Offshore platforms, Floating powerplants, Petroleum.

The purpose of this Conference was to bring together industrial proponents of energy-related activities proposed for the shelf; members of the oceanopraphic scientific community who have been trying to understand important coastal oceanographic processes, both of natural and of anthropogenic origin; representatives of regulatory agencies who are attempting to set the standards through which man's activities on the coastal shelf will be controlled; and representative of the public who will be affected by both the benefits and the risks of coastal enterprises. Panel discussions were concerned with resoursce development, environmental assessment, regulations, and public participation. The papers have been individually abstracted. (See W77-04935 thru W77-04948) (Sinha-OEIS)
W77-04934

POTENTIAL POWER-GENERATING STATIONS ON THE ATLANTIC CONTINENTAL SHELF,
Public Service Electric and Gas Co., Newark, N. J.
R. L. Mittl.
In: Proceedings of Conference Effects of Energy-Related Activities on the Atlantic Continental Shelf, held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, June 1976. p 1-11. 7 fig, 1 tab.

Descriptors: *Powerplants, *Resources development, *Baseline studies, Nuclear powerplants, Electric powerplants, Continental Shelf, Safety factors.
Identifiers: *Outer Continental Shelf, *Energy resources, Environmental conditions, Floating powerplants, U.S. East Coast, Offshore technology, Atlantic Continental Shelf.

The concept of offshore floating nuclear plats has some important advantages in addition to site availability and cooling water considerations. These include simplification of the licensing process, reduced overall design and construction time, and enhanced quality control. Placing floating nuclear plants offshore is not without challenges. The majority are associated with the ocean environment and relate to maximum wave height, water depth, and potential shipping hazards. Environment radiation monitoring will be conducted by methods similar to those used for land-site investigations, but adapted to the peculiarities of the ocean environment. The natural radiation levels in the ocean water, sediments, and marine biota in the vicinity will be measured. Special attention will be given to radioisotope concentration by marine species, passage to higher trophic levels, and potential critical pathways to human consumption. No assumption is made that the plant, because of its remote offshore location, can operate under relaxed requirements for effluent releases. The comprehensive program of environmental studies will establish the existing conditions, and continuing studies will determine whether or not offshore nuclearpowered generating stations will have an adverse effect on the environment. (See also W77-04934) (Sinha-OEIS)
W77-04935

NATURE OF POTENTIAL OIL INDUSTRY OPERATIONS ON THE ATLANTIC CONTINENTAL SHELF,
Mobil Oil Corp., New Orleans, La.
E. O. Bell.
In: Proceedings of Conference Effects of Energy-Related Activities on the Atlantic Continental Shelf, held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 12-30, June 1976. 24 fig.

Descriptors: *Oil industry, *Resources development, Drilling, Exploration, Seismic studies.
Identifiers: *Outer Continental Shelf, *Energy resources, *Environmental protection, Offshore technology, Atlantic Continental Shelf.

A brief oveview of offshore oil industry activity from the first seismic survey through the exploratory drilling, development drilling, and finally the production phase was presented. The petroleum industry has drilled some 20,000 offshore oil and gas wells in the Gulf of Mexico and offshore California and Alaska with no incident that has resulted in permanent damage to the environment. The industry has the work force, the technical skills, the management, and the organization to meet the future needs of the people and to protect the environment at the same time. (See also W77-04934) (Sinha-OEIS)
W77-04936

WIND-DRIVEN AND THERMOHALINE CIRCULATION OVER THE CONTINENTAL SHELVES,
Woods Hole Oceanographic Institution, Mass.
G. T. Csanady.
In: Proceedings of Conference Effects of Energy-Related Activities on the Atlantic Continental Shelf, held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 31-47, June 1976. 9 fig, 7 ref.

Descriptors: *Baseline studies, *Resources development, Continental shelf, Water resources, Boundary layers.
Identifiers: *Outer Continental Shelf, *Energy resources, Thermohaline circulation, Wind-driven currents, Wind stress.

The more chaotic patterns of flow induced by the winds and by the differences in temperature and salinity between different parts of the shelf, which are referred to as thermohaline circulation are discussed. The physical properties of water movements over continental shelves are considered. The mathematical arguments necessary for a more rigorous approach are omitted. To draw one specific conclusion, much of the 'action' seems to take place in a coastal zone about 10 km in width, and this zone should receive special attention in any large-scale observation program. A deployment of current meters on an even grid (20-km spacing) is likely to miss this zone almost entirely, a resolution of 1 to 2 km being necessary near shore. Much of the same goes for the frontal zone at the shelf break, where a resolution of 3 to 5 km would appear to be necessary in the cross-isobath direction. (See also W77-04934) (Sinha-OEIS)
W77-04937

TIDAL WATER MOVEMENTS,
Dalhouse Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-04938

AN INTRODUCTION TO SHEAR FLOW DISPERSION AND ITS RELEVANCE TO DISPERSION ON THE CONTINENTAL SHELF,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04939

REVIEW OF OIL SPREADING ON THE SEA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W77-04940

PLANKTON PROCESSES IN MID-ATLANTIC NEARSHORE AND SHELF WATERS AND ENERGY-RELATED ACTIVITIES,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04941

PETROLEUM, TEMPERATURE, AND TOXICANTS: EXAMPLES OF SUSPECTED RESPONSES BY PLANKTON AND BENTHOS ON THE CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-04942

STRUCTURE AND STABILITY IN THREE MARINE BENTHIC COMMUNITIES IN SOUTHERN NEW ENGLAND,
Marine Biological Lab., Woods Hole, Mass.
For primary bibliographic entry see Field 5C.
W77-04943

PATTERNS OF LARVAL FISH DISTRIBUTIONS IN THE MIDDLE ATLANTIC BIGHT,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
A. W. Kendall, Jr.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 126-145, June 1976. 18 fig, 16 ref.

Descriptors: *Baseline studies, *Resources development, *Marine fish, Fish behavior, Life-history studies.
Identifiers: *Outer Continental Shelf, *Energy resources, *Middle Atlantic Bight, Ichthyoplankton, Environmental factors.

The early life history of marine fishes are described, the utility of studying young stages of fish relative to fisheries and oceanographic problems are explained and the present state of knowledge of ichthyoplankton studies in the Northwest Atlantic Ocean is illustrated. Some generalizations that seem relatively important in measuring the impact of man's activities in this area are given. There is no place or time not used by some fish in the Middle Atlantic Bight for spawning and larval development. Spawning areas for each species generally shift along the coast seasonally. The sizes of year-classes of fish are largely determined by differential mortality during the egg and larval stages. These stages are quite vulnerable and sensitive to many forms of environmental stress, even conditions lasting only a few days. Fishes with dissimilar habits and economic importance as adults may be competitors or predators as larvae and thus influence each

others' year-class strength. Density-dependent mortality may also occur during the larval period. (See also W77-04934) (Sinha-OEIS)
W77-04944

FISHERIES AND RENEWABLE RESOURCES OF THE NORTHWEST ATLANTIC SHELF,
National Marine Fisheries Service, Woods Hole, Mass. Northeast Fisheries Center.
R. C. Hennemuth.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 146-166, June 1976. 12 fig, 8 tab, 11 ref.

Descriptors: *Resources development, Continental Shelf, Fisheries, Recreation, Ecology, Ecosystems, Atlantic Ocean.
Identifiers: *Outer Continental Shelf, *Energy resources, *Commercial fisheries, Sport fishery, *Northwest Atlantic Shelf, Renewable resources.

The shelf and waters off the New England and Middle Atlantic states must be considered as a well-integrated ecosystem. Small, selected areas cannot be considered independently in terms of evaluating effects of proposed or ongoing activities. The rapid imposition on this ecosystem of massive activities and substances foreign to the natural course of events will produce persistent disequilibria. Severe and long-lasting actions will be required for a return to a previous state. The effects cannot be predicted with any degree of certainty. The possible courses of events are almost infinite in relation to our ability to define and evaluate them. Almost any activity of any scope on the shelf will create conflicts with fishing activities and with the objective of maximizing catch. (See also W77-04934) (Sinha-OEIS)
W77-04945

SOME ASPECTS OF BOTTOM SEDIMENT TRANSPORT MECHANICS ON THE CONTINENTAL SHELF,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2L.
W77-04946

BEDFORMS ON THE U.S. ATLANTIC CONTINENTAL SHELF: A REVIEW,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Sea Grant.
D. B. Duane.
In: Proceedings of Conference 'Effects of Energy-Related Activities on the Atlantic Continental Shelf', held at Brookhaven National Laboratory, Upton, NY, Nov 10-12, 1975, p 185-206, June 1976. 9 fig, 1 tab, 63 ref.

Descriptors: *Baseline studies, *Resources development, Continental shelf, Geomorphology, Engineering, Reviews.
Identifiers: *Outer Continental Shelf, *Energy resources, *Offshore technology, *Atlantic Continental Shelf, Environmental factors.

The marine environment of the North Sea is more severe than that of the U.S. Atlantic Continental Shelf. Therefore, experience gained by companies engaged in energy production activities in the North Sea would be directly applicable to analogous activities on the Atlantic shelf. Although identical structures would certainly function as well here as there, they would probably be overdesigned rather than optimum. As long as offshore conditions, such as waves, can be measured only statistically, any structure will suffer damage sooner or later. For optimum deisgn, the structure or activity should meet requirements at minimum total cost commensurate with risks. The sea floor comprises a variety of forms, varying in scale through many orders of magnitude. Many of the forms are mobile, although at varying rates, responding in some measure to the energy imparted to the sediment through movement of the water mass. While factors relating motion of the ter mass to movements of sediments and bedforms on the sea floor are not yet known with great accuracy, good estimates based on reasonable assumptions can be made which lead to optimum design characteristics. (Sinha-OEIS)
W77-04947

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENTS,
State Univ., of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W77-04948

OUTDOOR RECREATION IN WATERSHED RESERVES,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-04996

METHODOLOGY AND CRITERIA FOR SITING ENERGY PLANTS IN IDAHO,
Idaho Univ., Moscow. Water Resources Research Inst.
C. C. Warnick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 044, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, June 1976. 74 p, 9 fig, 9 tab, 55 ref, 5 maps. OWRT A-048-IDA(2), 14-34-0001-6013.

Descriptors: Geothermal studies, Thermal powerplants, Electric powerplants, Thermal power, Hydroelectric plants, Electric power production, *Methodology, Decision making, *Classification, Evaluation, Legislation, *Idaho, *Criteria, Sites, Regulation, State governments.

A review is presented of energy plant siting criteria, methodologies, guidelines and programs that are being considered in this country. A preliminary screening approach for siting energy plants in Idaho is presented and a detailed hierarchal classification system for siting criteria has been developed. Methodology for using the criteria is suggested. Experience of a workshop trying to identify problems of implementing a ranking and rating for siting energy plants in the general situation for Idaho is reported. A brief analysis is presented on the needs for regulations and legislation to implement a future program of evaluation that would benefit utilities, the planning agencies, and the regulatory agencies operating within Idaho.
W77-05006

ECOLOGIC MODELS,
Manhattan College, Bronx, N.Y. Environmental Engineering and Science Program.
For primary bibliographic entry see Field 5B.
W77-05016

THE ECOLOGICAL IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, Fla.
For primary bibliographic entry see Field 5C.
W77-05028

GROWTH WITH ENVIRONMENTAL AWARENESS,
For primary bibliographic entry see Field 6E.
W77-05044

SELECTED ENVIRONMENTAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
For primary bibliographic entry see Field 6E.
W77-05054

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NPDES PROGRAM: APPLICATION OF PERMIT PROGRAM TO AGRICULTURAL ACTIVITIES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-05061

7. RESOURCES DATA

7A. Network Design

DESIGN AND OPTIMIZATION OF GROUNDWATER MONITORING NETWORKS FOR POLLUTION STUDIES,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5A.
W77-04759

METHODOLOGY AND CRITERIA FOR SITING ENERGY PLANTS IN IDAHO,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W77-05006

7B. Data Acquisition

AN ELECTRICAL CONDUCTIVITY PROBE FOR DETERMINING SOIL SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W77-04763

THE APPLICABILITY OF PLANETARY BOUNDARY LAYER THEORY TO CALCULATE REGIONAL EVAPOTRANSPIRATION,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
For primary bibliographic entry see Field 2D.
W77-04771

COMPUTATION OF SOLAR RADIATION FROM SKY COVER,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W77-04772

WATER TEMPERATURE FORECASTING AND ESTIMATION USING FOURIER SERIES AND COMMUNICATION THEORY TECHNIQUES,
Tennessee Technological Univ., Cookeville. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W77-04774

INSTRUMENTATION: AUTOMATIC COLLECTION OF SEDIMENT DATA,
Geological Survey, St. Paul, Minn. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-04987

AN ELECTRONIC MONITOR FOR TOTAL DISSOLVED GAS PRESSURE,
Virginia Mason Research Center, Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-05083

7C. Evaluation, Processing and Publication

THE NORTH PLATTE RIVER BASIN ECONOMIC SIMULATION MODEL (A TECHNICAL REPORT AND SUPPLEMENT TO THE TECHNICAL REPORT),
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W77-04601

SHORT COURSE PROCEEDINGS: APPLICATIONS OF STORMWATER MANAGEMENT MODELS.
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04730

SELECTED CASE STUDIES USING STORMWATER MANAGEMENT MODELS -- QUANITITY ASPECTS,
Orlob (G. T.), and Associates, Orinda, Calif.
For primary bibliographic entry see Field 2E.
W77-04740

PLANNING A STUDY USING STORMWATER MANAGEMENT MODELS,
Orlob (G. T.), and Associates, Orinda, Calif.
For primary bibliographic entry see Field 5B.
W77-04741

DETECTION OF TRENDS IN WATER QUALITY DATA FROM RECORDS WITH DEPENDENT OBSERVATIONS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-04753

TABLES OF GEOMETRY FOR LOW-STANDARD ROADS FOR WATERSHED MANAGEMENT CONSIDERATIONS, SLOPE STAKING, AND END AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W77-04831

OCEANOGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT: DATA REPORT FOR R.V. EASTWARD CRUISES E-3-74 (24-30 APRIL 1974) AND E-12-74 (23-31 JULY 1974),
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W77-04835

SUSPENDED SEDIMENT DATA FROM NEARSHORE WATERS OF GEORGIA,
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2J.
W77-04836

HYDROGRAPHY OF ONSLOW BAY, NORTH CAROLINA: SEPTEMBER 1975 (OBIS II),
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W77-04837

DOCUMENTATION OF FOUR OCEAN-RELATED COMPUTER MODULES,
Massachusetts Inst. of Technology, Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W77-04838

ONSLOW BAY INTRUSION STUDY: HYDROGRAPHIC OBSERVATIONS DURING CURRENT METER SERVICING CRUISES IN AUGUST, OCTOBER, AND DECEMBER 1975 OBIS I, III AND IV,
Georgia Univ., Savannah. Marine Extension Center.
For primary bibliographic entry see Field 2L.
W77-04839

LAKE ONTARIO ATLAS: LAND USE,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W77-04846

LIGHT EXTINCTION MEASUREMENTS IN THE EXPERIMENTAL LAKES AREA--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W77-04862

PHYTOPLANKTON PRIMARY PRODUCTION IN THE EXPERIMENTAL LAKES AREA USING AN INCUBATOR TECHNIQUE--1975 DATA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W77-04868

WATER QUALITY AND BATHYMETRY OF SAND LAKE, ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
D. E. Donaldson.
Open-file report 76-254, 1976. 1 sheet, 21 ref.

Descriptors: *Water quality, *Lakes, *Alaska, *Chemical analysis, Bathymetry, Trace elements, Nutrients, Dissolved oxygen, Urban runoff, Inflow, Snowmelt, Runoff, Pollutant identification, *Maps.
Identifiers: *Sand Lake(Alaska), Anchorage(Alaska).

Sand Lake, a dimictic lowland lake in Anchorage, Alaska, has recently become as urban lake. Analyses indicate that the lake is oligotrophic, having low dissolved solids and nutrient concentrations. Snowmelt runoff from an adjacent residential area, however, has a dissolved-solids concentration 10 times that of the main body of Sand Lake. Lead concentrations in the runoff exceed known values from other water in the ANchorage area, including water samples taken beneath landfills. The volume of the snowmelt runoff has not been measured. The data presented can be used as a baseline for water-resource management. (Woodard-USGS)
W77-04970

MAPS SHOWING GROUND-WATER CONDITIONS IN THE CONCHO, ST. JOHNS, AND WHITE MOUNTAINS AREAS, APACHE AND NAVAJO COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, Ariz. Water Resources Div.
R. W. Harper, and T. W. Anderson.
Water-Resources Investigations 76-104 (open-file report), August 1976. 4 sheets, 3 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water quality, *Water levels, Arizona, *Maps, Hydrographs, Well data, Irrigation.
Identifiers: *Apache and Navajo Counties(Ariz).

The Concho, St. Johns, and White Mountains areas cover about 2,300 sq mi in eastern Arizona. Ground water is present in several aquifers that are made up of one or more formations. The maps show ground-water conditions in the Coconino aquifer; in the Triassic, Cretaceous, and Tertiary rocks; and in the alluvium and basaltic rocks. Information on the maps includes depth to water, altitude of the water level, chemical quality of the water, irrigated area, and hydrographs of the water level in selected wells. Scale 1:125,000. (Woodard-USGS).
W77-04971

WATER USE IN MISSISSIPPI, 1975,
Geological Survey, Jackson, Miss. Water Resources Div.
J. A. Callahan.
Water-Resources Investigations 76-125 (open-file report), December 1976. 1 sheet, 1 fig, 1 tab, 6 ref.

Descriptors: *Water utilization, *Water users, *Mississippi, *Groundwater, *Surface waters, Water supply, Municipal water, Domestic water, Industrial water, Powerplants, Fish farming, Wildlife.
Identifiers: Rural water supplies.

Water use in Mississippi in 1975 amounted to 3,050 mgd (million gallons per day). The total represents pumpage of 1,130 mgd from ground-water sources and 1,920 mgd from surface-water sources. Included in the surface water pumpage are 540 mgd of brackish water from Back Bay of Biloxi. Public Supplies at Jackson in Hinds County and Meridian in Lauderdale County use both surface and ground water. Columbus in Lowndes County uses only surface water. All other public supplies in the State use ground water. A table shows the amount, source, and user of water used in each county of Mississippi during 1975. (Woodard-USGS)
W77-04972

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1975--VOLUME 1. MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, RIO GRANDE BASIN.
Geological Survey, Denver, Colo.
Water-Data Report CO-75-1, December 1976. 260 p, 4 fig, 5 tab, 40 ref.

Descriptors: *Colorado, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Streamflow, Flow rates, Gaging stations, Sediment yield, Lakes, Reservoirs, Observation wells, Well data, Water levels, Water analysis, Water temperature, Basic data collections.

Water resources data for Colorado for the 1975 water year consists of records of stage, discharge, and water quality streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report (Volumes 1 and 2) contains discharge records for 367 gaging stations, stage and contents of 22 lakes and reservoirs, 5 partial-record flow stations, 77 crest-stage partial-record stations, and 4 miscellaneous sites; water quality for 91 gaging stations and 15 miscellaneous sites; and water levels for 49 observation wells. A few pertinent stations in bordering States are also included. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Colorado. (Woodard-USGS)
W77-04975

WATER RESOURCES DATA FOR CALIFORNIA, 1974: PART 2. WATER QUALITY RECORDS.
Geological Survey, Menlo Park, Calif.
Data Report for California, 1974. 700 p, 2 fig, 6 tab, 23 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Sediment transport, *California, Data collections, Water analysis, Chemical analy-

sis, Water temperature, Turbidity, Bacteria, Water chemistry, Biochemistry.

Water-resources data collected at 453 sites in California for the 1974 water year include records for chemical, physical, and biological characteristics of surface and ground water. These data were collected from designated sampling sites at predetermined intervals such as once daily, weekly, monthly, or less frequently, and at some sites data were recorded on punched paper tape at 15-, or 30-, or 60-minute intervals. The distribution, type, and number of stations in each river or drainage basin are shown on a map. A few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System collected by the Geological Survey and Cooperating State and Federal agencies in California. (Woodard-USGS)
W77-04976

DETERMINATION OF CHANNEL CAPACITY OF THE SACRAMENTO RIVER BETWEEN ORDBEND AND GLENN, BUTTE AND GLENN COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-04977

RECONNAISSANCE WATER SAMPLING FOR RADIUM-226 IN CENTRAL AND NORTHERN FLORIDA, DECEMBER 1974--MARCH 1976,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-04983

WATER LEVELS IN ARTESIAN AND NONARTESIAN AQUIFERS OF FLORIDA, 1973-74,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-04985

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1973.
California State Resources Agency, Sacramento; and California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2L.
W77-05022

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1975 - OCTOBER 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05023

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05024

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1975 - JANUARY 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05025

OIL SPILL AND OIL POLLUTION REPORTS FEBRUARY 1976 - APRIL 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-05026

INTERIM CLASSIFICATION OF WETLANDS AND AQUATIC HABITATS OF THE UNITED STATES,
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-05049

8. ENGINEERING WORKS

8A. Structures

REPORT TO U.S. DEPARTMENT OF THE INTERIOR AND STATE OF IDAHO, ON FAILURE OF TETON DAM.
For primary bibliographic entry see Field 8D.
W77-04632

THE (COASTAL PLAINS REGIONAL CENTER) DEEPWATER TERMINAL STUDY,
Coastal Plains Regional Commission, Washington, D. C.
For primary bibliographic entry see Field 6B.
W77-05030

STRUCTURAL MODIFICATIONS,
Army Engineer District, Portland, Oreg.
H. A. Smith, Jr.
Presented at Governor's Meeting, Nitrogen Supersaturation Problem - Columbia and Snake Rivers, Bonneville Power Administration, Portland, Oregon, March 23, 1971. 9 p., 4 fig.

Descriptors: *Columbia River, Hydroelectric power, Chinook, *Fish diseases, *Supersaturation, Dams, Dam sites, On-site investigations, Nitrogen, Fish behavior, Engineering, Engineering structures, Hydraulic design, Spillways, Fish migration, Hydraulic structures, Hydraulic turbines.
Identifiers: *Snake River, *Structural modification(Dams), *Spillway-stilling basin structures, Skeleton Bays, Multi-Orifice bulkheads, Gas bubble disease, Gas supersaturation, Nitrogen supersaturation.

Proposed structural and operational modifications to dams on the Snake and Columbia Rivers to minimize the effects of atmospheric gas supersaturation (nitrogen supersaturation) are outlined. Proposals are for eliminating or modifying spillway flow, modification of spillway-stilling basin structures, use of skeleton bays, development of multi-orifice bulkheads. (Katz)
W77-05087

PROPOSED RESEARCH AND DEVELOPMENT PROGRAM IN FISCAL YEARS 1973 AND 1974 AT COLUMBIA AND SNAKE RIVER PROJECTS FOR NITROGEN CONTROL,
Oregon Fish Commission, Portland.
R. N. Thompson.
July 18, 1972, 10 p., 1 tab.

Descriptors: *Columbia River, *Salmon, Mortality, On-site investigations, Washington, Oregon, Idaho, Juvenile fish, Fish migration, Fish passages, Fish behavior, Spillways, Hydraulic turbines, Engineering structures, Hydraulic engineering, Dam, Dam sites, Hydroelectric power, Saturation, Rainbow trout, *Supersaturation.
Identifiers: *Snake River, Snake River Dams, *Nitrogen supersaturation, Spillway deflectors, Steelhead trout.

A proposed research and development program relating to control of nitrogen supersaturation at main stem Columbia and Snake River dams. All control devices listed in the proposal for construction at the projects should be tested for functional adequacy prior to full scale installation. (Katz)
W77-05089

STEPS BEING TAKEN BY CORPS OF ENGINEERS TO RESOLVE NITROGEN PROBLEMS,
Army Engineer Div. North Pacific, Portland, Oreg.
For primary bibliographic entry see Field 5C.
W77-05090

NOTES FOR MID-COLUMBIA PUD'S AND WASHINGTON DEPARTMENT OF ECOLOGY MEETING ON REVISED CONCEPTUAL PLAN FOR COMPLYING WITH SUPERSATURATED GAS STANDARD.
Mid-Columbia Public Utility Districts, Ephrata, Wash.
For primary bibliographic entry see Field 5C.
W77-05093

8B. Hydraulics

DEVELOPMENT AND APPLICATION OF A SIMPLIFIED STORMWATER MANAGEMENT MODEL,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W77-04637

ASSESSMENT OF MATHEMATICAL MODELS FOR STORM AND COMBINED SEWER MANAGEMENT,
Battelle Pacific Northwest Labs., Richland, Washington, Water and Land Resources Dept.
For primary bibliographic entry see Field 5D.
W77-04638

SIMULATED FIELD STUDY FOR I/I ANALYSIS,
For primary bibliographic entry see Field 5D.
W77-04662

PREDICTION OF VINYL CHLORIDE MONOMER MIGRATION FROM RIGID PVC PIPE,
Goodrich (B. F.) Research and Development Center, Brecksville, Ohio.
For primary bibliographic entry see Field 5B.
W77-04720

FLOOD DAMAGE MITIGATION.
For primary bibliographic entry see Field 6F.
W77-04724

A NOTE ON LONG WAVES IN SHALLOW CHANNELS WITH RUNNING WATER,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2E.
W77-04752

THE EFFECT OF VERTICAL SAND DRAINS ON THE HYDRAULIC RESISTANCE OF A SEMI-PERVIOUS LAYER,
International Water Supply Consultants, Rotterdam (Netherlands).
For primary bibliographic entry see Field 8D.
W77-04877

SOME REMARKS ON COMPUTER MODELING OF COASTAL FLOWS,
California Univ., Berkeley. Dept of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-04897

MODEL OF HURRICANE TIDE IN CAPE FEAR ESTUARY,
National Meteorological Center, Washington, D.C.

For primary bibliographic entry see Field 2L.
W77-04898

8C. Hydraulic Machinery

CONSIDERATIONS FOR ELECTRICAL DESIGN IN SEWAGE LIFT STATIONS,
L. M. Applegate.
Public Works, Vol. 107, No. 12, p 59-60, December, 1976. 2 fig.

Descriptors: *Pumps, *Performance, *Hydraulic machinery, *Sewage treatment, Waste water treatment, *Treatment facilities, Electrical design, Electric motors, Capacitors, Pumping plants, California.
Identifiers: Oroville(Calif), Variable Frequency Drive.

The Oroville (California) Sewerage Commission has built sewage lift stations in an area which is several feet too low for complete gravity collection. The pumps raise sewage for gravity drainage to a much larger pump station. However, the flow is such that the problem of on-off operation develops when pumps operate at full speed. To sove this problem, a Variable Frequency Drive (VFD) system with a full-load efficiency of about 95% was implemented. In this system, 60-hertz commercial power is rectified into unidirectional current which produces a 3-phase group of single-phase waves. These are remade into alternating sequences of square waves, forming a 3-phase square-wave counterpart of 3-phase sine waves. The motors operate as if they were served a normal sine-wave input. The system works well if the original alternating current source is not affected by left-overs from rectfication. There is a possible drawback with standby generators. If they have power ratings similar to the motor load ratings, they can be incompatible with the load if the generator voltage regulator is sensitive and fast in response to voltage changes. The problem can be overcome. This was the problem with the new station. Capacitors were used to smooth out and slow up regulator response. The modification allowed the generator to start and carry perfectly both 50-hp motors operating through VFD. The designed flexibility of the pumps created a necessity for consideration of a simpler and more economical design of the VFD system. (Collins-FIRL)
W77-04706

SURF-TURBINE GENERATING SYSTEM,
W. A. Sherrard.
U.S. Patent No. 3,983,404, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 950, No 4, p 1661, September 28, 1976.

Descriptors: *Patents, *Ocean waves, *Surf, *Tides, Tidal effects, Tidal energy, Electric power production, Tidal powerplants, Turbines.

An electrical generator is powered by the kinetic energy in ocean waves breaking at the shore. Waves are directed up an inclined surface through which an intake port is placed at a level substantially below the average wave height and extending across the entire length of the generator. Water enering the port is directed to drive the blades of a turbine located below the inclined surface but above the normal water level. Water overshooting the port is collected as it flows back down the surface by a second port which similarly feeds the water to drive the turbine. Water overshooting the top of the inclined surface is collected in a flow-reversing channel and directed to drive the turbine. The system is mounted on wheels which are movable on rails extending from the ocean floor onto the beach, where the system can be moved to optimum position for different tidal conditions. (Sinha-OEIS)
W77-04954

WATERWHEEL DRIVEN ELECTRICAL GENERATOR,
J. J. Brewer.
U.S. Patent No. 3,984,698, 5 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 373, October 5, 1976.

Descriptors: *Patents, *water utilization, *Water wheels, Engineering structures, Electric power production, Generators, Hydroelectric power.
Identifiers: Prime movers.

An electrical generator system includes a waterwheel apparatus as a prime mover. The waterwheel apparatus has pivoted buckets mounted in circumferentially spaced relation around a central hub and has an outer rim provided with a ting gear driving a pinion gear on the generator shaft for obtaining a high rotational speed in a generator from a relatively slow turnign waterwheel. The waterwheel buckets each fold outward to hold a maximum quantity of water as the bucket reaches approximately the horizontal center line of the wheel on the downward moving side of the wheel while each bucket empties at the vertical center line of the wheel as the bucket passes the bottom side and thereafter folds inward as the bucket moves upward and over the top of the wheel. (Sinha-OEIS)
W77-04969

8D. Soil Mechanics

REPORT TO U.S. DEPARTMENT OF THE INTERIOR AND STATE OF IDAHO, ON FAILURE OF TETON DAM.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price $9.00. Stock No. 024-003-00110-4. Independent Panel to Review Cause of Teton Dam Failure, Wallace L. Chadwick (ASCE), Chairman, Idaho Falls, Idaho, December 1976. 580 p, 7 append.

Descriptors: Dams, *Dam failure, *Dam design, Dam foundations, *Earth dams, *Foundation failure, *Idaho, *Soil mechanics, Soil stability, Porosity, *Pervious soils, Permeability, Fracture permeability, Grout curtains, Joints(Geologic), Igneous rocks, *Dam construction, Silts, Reservoir leakage, Underseepage.
Identifiers: *Internal erosion(Piping), *Teton Dam failure(Idaho), *Sealed rock joints(Failure).

Teton Dam and its reservoir were principal features of the Teton Basin Project, a multipurpose project embodying flood control, power generation, and supplemental irrigation water supply. The dam was a central-core zoned earthfill structure, with a height of 305 ft above the riverbed and 405 ft above the lowest point in the foundation. Provisions for seepage control included a key trench in the foundation rock above El. 5100 and a cutoff trench to foundation rock below that elevation. A grout curtain extended below these trenches. Teton Dam failed on June 5, 1976, when the reservoir was at El. 5301.7, 3.3 ft below the spillway sill. Although downstream warnings are believed to have been timely, deaths of 14 persons and property damage estimated variously from 400 million to one billion dollars have been attributed to the failure. The Panel conducted a comprehensive study of the failure, including review of planning, design, construction, and operation of the dam and reservoir. Extensive field exploration, laboratory testing, and data analysis were accomplished. The Panel concluded (1) that the dam failed by internal erosion (piping) of the core of the dam deep in the right foundation key trench, with the eroded soil particles finding exits through channels in and along the interface of the dam with the highly pervious abutment rock and talus, to points at the right groin of the dam, (2) that the exit avenues were destroyed and removed by the outrush of reservoir water, (3) that openings existed through inadequately sealed rock joints, and may have developed through cracks in the core zone in the key trench, (4) that, once started, piping progressed rapidly through the main body of the dam and quickly led to complete failure, (5) that the design of the dam did not adequately take into account the foundation conditions and the characteristics of the soil used for filling the key trench, and (6) that construction activities conformed to the actual design in all significant aspects except scheduling. (Bur Reclam)
W77-04632

THE EFFECT OF VERTICAL SAND DRAINS ON THE HYDRAULIC RESISTANCE OF A SEMI-PERVIOUS LAYER,
International Water Supply Consultants, Rotterdam (Netherlands).
N. A. Amesz.
Journal of Hydrology, Vol 31, No 3/4, p 323-333, December 1976. 7 fig, 1 tab, 7 ref.

Descriptors: *Piles(Foundations), *Sands, *Consolidation, *Clays, Soil mechanics, Aquicludes, Pore water, Pore pressure, Groundwater movement, Drainage, Permeability, Hydraulic properties, Mathematical models, Equations, Penetration.
Identifiers: *Sand piles, *Sand walls.

Sand piles are frequently used for soil-mechanical purposes in order to accelerate the consolidation of clay layers. However, when the clay layer has a significant function in the hydrological regime of an area, this regime will be permanently disturbed. Especially when the clay layer functions as a hydraulic resistance to a vertical flow of brackish or salt groundwater from lower aquifers, the resistance will decrease, thus increasing the seepage. As a first approach to the problem, the grid of sand piles is replaced by a row of sand walls. In this paper, the two-dimensional flow of groundwater towards the sand wall was analyzed in three ways. One way was a rough estimate, while the other two methods were more accurate because they were based on complex variable techniques. (Visocky-ISWS)
W77-04877

8E. Rock Mechanics and Geology

REPORT TO U.S. DEPARTMENT OF THE INTERIOR AND STATE OF IDAHO, ON FAILURE OF TETON DAM.
For primary bibliographic entry see Field 8D.
W77-04632

8F. Concrete

EPOXY MORTAR AND COATING PROVIDE NEW LIFE FOR INVERT.
Water and Sewage Works, Vol. 123, No. 12, p 74, December, 1976.

Descriptors: *Conduits, *Culverts, *Corrosion control, *Coatings, *Concrete construction, Concrete structures, Reinforced concrete, Asphaltic concrete, Corrosion, Chemical degradation, Sewerage, Construction materials, California.
Identifiers: Epoxy mortar, Santa Rosa(Calif).

A 14,000 square foot box culvert invert beneath Santa Rosa, California, uses a combination of a rock-hard epoxy mortar and an erosion-resistant epoxy coating to provide long-term protection. The culvert is one of three which aid flood and high water runoff. It is constructed of a foot-thick reinforced concrete slab which has a full-length wall on one side and a 4-foot wall on the other side. During the past 12 years, erosion has occurred from flooding, abrasive debris, sulfates and lignins. Overlays of portland cement concrete or asphaltic concrete were rejected because they

could not ensure corrosion resistance. The epoxy coating is designed to protect portland cement concrete from moisture, abrasion, wear and many corrosive chemicals. No signs of wear were found after 10 months of use. (Collins-FIRL)
W77-04667

8G. Materials

FORCE MAIN SEWER LINE USES POLYETHYLENE PIPE.
Water and Wastes Engineering, Vol. 13, No. 12, p 16, December, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewers, *Pipelines, *Plastic pipes, Sewerage, Treatment facilities, Installation, Louisiana.
Identifiers: *Polyethylene pipe, Ruston(La).

An installation of a 16,640 ft, 14-in. polyethylene sewer force main was installed in Ruston, Louisiana. It connected a treatment plant, being phased out, with a new one across town. This is part of the first of three stages in the rehabilitation of the community's waste treatment program. The high density polyethylene pipe, under pressure up to 100 psi, was chosen because it can withstand the vibration stresses resulting from three passes under railroad tracks. Variable speed pumps will minimize shock waves when line pressure is increased or decreased. Economy and safety of construction was improved since hydraulic backfilling of ditches eliminated the need for men in the ditches after pipe laying. (Collins-FIRL)
W77-04659

PLAIN END PIPE MEANS PRODUCTION EFFICIENCY,
P. E. Jeffers.
Brick and Clay Record, p 17-18, November, 1976. 6 fig, 1 tab.

Descriptors: *Clay pipes, *Efficiencies, *Joints(Connections), *Shales, *Clays, Curves, Drying, Rubber, Bronze, Stainless steel, Plastics.

The advantages of manufacturing plain end pipe are many. Forming is faster and easier, dryer and kiln space is reduced, jointing is simplified, and shipping is streamlined by permitting more compact packaging. The pipe is manufactured from a combination of shale and fireclay. It is formed by extrusion, and a special press manufactures curves, elbows, and traps. Branching is accomplished manually. After forming, the pipe is dried with hot air for 16 hr to 7 days. After drying, the pipe is fired. Two types of jointing systems are used. A plain end coupling made from rubber, silicon bronze, stainless steel, and plastic is available in several sizes. Another coupling, used with automatic equipment, consists of a urethane ring cast on each end of the pipe and coupled together with a sleeve. (Snyder-FIRL)
W77-04660

SEWER CLEANING SYSTEM COMBINES VERSATILITY, LOW INITIAL COST,
Monroe Water and Sewer Maintenance, N. C.
B. A. Twitty, Jr.
Public Works, Vol. 108, No. 1, p 47-48, January, 1977.

Descriptors: *Cleaning, *Initial costs, *Cities, North Carolina, *Efficiencies, Sewers, Sewage effluents, Clogging.
Identifiers: Monroe(NC), Sewer Jet, Jet-Vac.

The city of Monroe, North Carolina, has tested a new sewer cleaning system. The power operated units, Sewer Jet and Jet-Vac, provide low initial cost, and better versatility and efficiency than mechanical sewer cleaners previously used. One advantage is that solids can be removed from sewer systems with the Jet-Vac. The procedure involves a high velocity jet nozzle fed through a manhold and thrust up the sewer through clogs by water at 2000 psi. Solids are flushed back and removed by the intake tube of the trailer system. Liquids and solids are simultaneously removed and solids are separated while the liquid returns, under pressure, through a discharge hose into the sewer line downstream. Economic advanatgaes have not been documented, but time involved for projects has been reduced from a matter of days to hours. Field tests indicated a cleaning capacity for 2000 feet of 8-inch diameter pipe of 1.5 hours with the use of 1000 gallons of water. This equipment can operate at temperatures as low as minus 40 F. The vacuum trailer system can operate all day without the necessity of dumping the sludge from the sealed tank. Maintenance and cleaning is a simple operation. the Jet-Vac can also be left to remove liquids and solids as the Sewer Jet moves on to clean other lines. There are various features for operator safety and noise suppression. (Collins-FIRL)
W77-04664

EPOXY MORTAR AND COATING PROVIDE NEW LIFE FOR INVERT.
For primary bibliographic entry see Field 8F.
W77-04667

APPARATUS FOR CONTROLLING MARINE FOULING OF SALT WATER COOLANT HEAT EXCHANGERS, PIPING SYSTEMS, AND THE LIKE,
General Dynamics Corp., Groton, Conn. (Assignee).
B. J. Freedman, and B. S. Ryskiewich.
U.S. Patent No. 3,984,302, 7 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 951, No 1, p 253, October 5, 1976.

Descriptors: *Patents, *Demineralization, *Sea water, *Water pollution control, *Chlorination, Fouling, Aquatic algae, Aquatic plants, Corrosion, Damages, Cooling water, Industrial use.

The invention relates to methods and apparatus for the control of marine fouling in systems using sea water and particularly to methods and apparatus for controlling marine fouling of tubular heat exchangers which use sea water coolants, and piping systems which transport sea water. Briefly described the invention controls fouling by chlorination produced by electrolyzing the sea water in situ within the heat exchanger itself and particularly at the inlet end of each of the tubes. Chlorine gas is then released at the inlet end of the tubes and is carried by the sea water through the tubes as the sea water flows through. Along the way the chlorine will combine withe the water to form hypochlorite ions or hypochlorous acid. The interior peripheral surfaces of the tubes are then exposed to the chlorine products and protected against foulding by marine life which is present in the sea water. (Sinha-OEIS)
W77-04956

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ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Cornell University, Policy Models for Water Resources Systems	W77-05008--05019	12
East Central Oklahoma State University, Agricultural Livestock Wastes	W77-04603--04626 04628--04631	28
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-04633--04654 04658--04660 04662--04686 04688--04720 04722--04725 04727--04743	104
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Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W77-04794 04796--04798 04800--04832	37
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University of Wisconsin, Water Resources Economics	W77-04850--04854 04856--04858	8

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B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-04601--04602 04995--05007	15
C. OTHER		
BioSciences Information Service	W77-04627 04655--04657 04661, 04687 04721, 04726 04746--04748 04773, 04778 04781, 04795 04799, 04842 04855, 04861 04865, 04872 04884, 04906 04912 04915--04916 05021, 05045 05097--05100	32
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Ocean Engineering Information Service (Patents)	W77-04950--04969	20
Ocean Engineering Information Service (Outer Continental Shelf)	W77-04934--04949 05020 05022--05028	24
U. S. Geological Survey	W77-04970--04994	25

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